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Vol. V. NEW YORK, MAY 30, 1885. No. 22.

Handsomely bound volumes of THE ELECTRICAL WORLD *for* 1884 *are now ready, and will be sent, charges prepaid, to any address on receipt of* $5.00.

PARTICULARS are given in our columns to-day of the proposition made to the stockholders and bondholders of the Postal Telegraph Company for its reorganization so that it may be put on a sound business basis and be able to complete its system.

WE have been favored by Mr. Shelford Bidwell with an advance abstract of the paper read by him recently before the English Royal Society, on the effects produced by magnetization in the length of rods of iron, steel and nickel. The whole of the abstract is given in today's issue, and will be found very interesting.

AS AN offset to the frequent comments on the alleged dangers incident to the use of electric lights, the news comes from England that the telephone rendered valuable assistance in exploring work at the time of the disaster at Usworth Colliery. As the use of electrical appliances becomes more general in mines, they will be found not only to assist in saving life, but to prevent accident. Had electric lights been used in the mine, the explosion would have been avoided.

ENCOURAGING reports come to hand of the progress of the work of the committees connected with the forthcoming Novelties Exhibition, to be opened in Philadelphia on the 15th of September. Thus far the number of applications for space exceed the number made at the same time last year for space in the Electrical Exhibition.

AS CAN easily be believed, all Massachusetts is exhibiting a lively interest in telephone affairs at the present time. The recent investigation by a legislative committee, the bringing of heavy suits in Lowell against the old telephone syndicate, and the approaching conference of telephone magnates and managers, have all provided New England with food for thought and conversation. The various issues were all discussed in our columns last week, and to-day we publish other news and criticism on these important topics of the hour.

THE effect of the ill-considered telephone legislation is to be seen in the notice issued by the Central Union Telephone Company to all renters of telephones in Indiana that the company will avail itself of the contract privilege to remove its instruments on June 30, the day on which the law regulating telephone rentals passed by the late Legislature goes into effect. It will be remembered that the Legislature passed a law limiting the rental of telephones to $8 per month, with a further reduction of 50 cents where two or more instruments were used.

IT was stated before the American Institute of Electrical Engineers, last week, that there is no chemical or electrical laboratory in the Patent Office at Washington. The whole of the available apparatus is not worth $500. In this era of prolific electrical invention it looks like the play of "Hamlet" without the melancholy Dane. It might be well to get Edison to invent a Congress which would be capable of doing something useful. We can hardly be accused of "undue partisanship" in advocating the idea that the Patent Office should have an electrical laboratory.

PATENTS for telephone transmitters and receivers are issued almost every week, embodying some new device for rendering articulation more distinct, and in a manner not heretofore applied. One of these is embodied in a patent issued last week to James P. Freeman, of Chicago, Ill. In the apparatus employed by him the primary current in the transmitter is broken and closed at each vibration of the diaphragm. In the light of past discussion regarding the feasibility of this mode of transmitting articulated speech the present invention is of considerable interest, and if it be feasible more will be heard about it.

OUR usually serious contemporary, the London *Electrician*, in its issue of May 15, says that "the discussion upon the project of MM. Bourdais and Sebillot of illuminating the whole world by means of 500,000 billions of arc lamps on the top of a big stick in Paris, commenced last week at a meeting of the members of the Société des Ingenieurs Civils." This project has had a lusty growth since we gave particulars of the original conceit in THE ELECTRICAL WORLD of July 5, 1884. In none other than a French society could such a debate be carried on. The lofty disregard of time and expense in completing the installation is to be commended, however, and if the work could only be brought down to the brief period of, say a hundred thousand years, or something like that, it would be quite reasonable.

HAVING held eight sittings and examined twenty-nine witnesses, the English Parliamentary Committee upon Telegraph and Telephone Wires have presented their report, which is published in our London exchanges of May 16. They say that the dangers and accidents from overhead wires have been very greatly exaggerated in number and importance. They favor not only the running of aërial wires but recommend increased facilities in the way of compulsory powers for those who wish to carry wires over lands and buildings without the owner's consent, the chief check being closer official supervision of the work. The effect of this report on electrical stocks has been excellent, and one is fain to hope that some of our reckless American legislators might learn a lesson of wisdom and moderation from the action of the committee.

WE published last week a list of the papers read at the meeting of the American Institute of Electrical Engineers. The list of subjects brought under discussion included the protection of electrical inventions, patent law, mine lighting by electricity, arc lamp mechanism, underground electric light wires, lightning rods, secondary batteries, incandescent lighting by central stations and isolated plants, the relative cost of gas and electricity, facsimile telegraphy. This is a programme of which the Institute may feel proud, especially as the discussions were serious and useful throughout. We publish to-day the first of the papers read, that by Mr. Frankland Jannus. It will be found well worthy of perusal by all interested in inventions and patents. The Institute has now entered upon its second year, with good officers, and every promise of healthy continuance.

THE Philadelphia *Record*, which is generally well abreast and often ahead of the times, seems to be a little slow in the matter of the proposed electric railway in Fairmount Park, to which it turns a very cold shoulder. We could convince the *Record* by figures from the electric railways now in operation that the system has already passed the point where it was "an expensive plaything in the hands of experimenters." If we understand aright, it is twelve miles in a direct line from the Green Street entrance of Fairmount Park to Indian Rock, at the other end of the same Park. Mr. Singerly may be able to drive his splendid spanking team over that 24-mile course in a single afternoon, and with all his accustomed grace and skill; no poor man can hope to drink in all the beauties of that lovely stretch of hill and dale where the Wissahickon winds in less than a two days' journey. He needs rapid transit, and steam is not suited for a park. An elevated electric road could be constructed in Fairmount Park through such a route as scarcely to be seen from behind the trees, skirting Lemon Hill, Laurel Hill Cemetery and that bank of the Wissahickon opposite to that on which the carriage drive is located. Fairmount Park is a vast and magnificent estate, yet not one person in ten in Philadelphia has ever been able to traverse it. The best proof of an electric railway in that park would be its immense popularity. It would pay its promoters, enable the poor to go as far and see as much as the rich, and at the worst would not be more unsightly than the huge iron elevators, or "observatories," which are now tolerated.

THE circumstances connected with the presentation to this country by the people of France of the Bartholdi Statue are well known to all our readers. The fact is also familiar that the New York *World* has exerted itself to raise $100,000—that sum being necessary for the completion of the Pedestal—of which it has received nearly $60,000. The statue is to be illuminated in some way by electricity, and hence it will serve to exemplify electrical progress as well as international amity. In New York, the leading electrical firms, companies and offices have already contributed handsomely, evincing their desire to see the gift from France properly installed in New York Harbor, the point of greatest travel between the Old World and the New. In order that electricians and all interested in electrical matters throughout the country may also add their quota to the Pedestal Fund, we have undertaken to receive subscriptions from places outside New York, as well as any from electricians in this city who have not yet put down their names. We show on page 218 the design that appears at the top of the subscription blanks sent out from this office. The smallest sum will be welcome, and each name and amount will be published in our columns as well as in the New York *World*. Subscription blanks can be obtained from us in any number on application. We hope that a material addition to the Pedestal Fund will be a result of this effort to support the *World* in its patriotic enterprise. We publish to-day a fine view of the Statue and Pedestal, as they will appear on Bedloe's Island, and we invite our electric light friends to come forward and say how they think the statue should be lighted. Their suggestions will be thankfully considered by the authorities.

WHEN, ten years ago, *The Operator* began to drop the gossip and small talk of the profession and to indulge in more serious and practical discussion, there was much complaint of becoming "too scientific" and "too theoretical." But the thought grew, men at the key read as they ran their circuits, studied and thirsted for more. Out of the new demand grew THE ELECTRICAL WORLD and a few imitators, and to-day there are men who got their first idea of a duplex from diagrams and explanations in *The Operator*, who now rank as first-class electricians, and draw pay as such. Since that small beginning, electrical societies have sprung up all over the country; electricity has become almost a craze among students at colleges; no science is more popular; and he who has not "read up" in the meantime finds himself shut out from much that is desirable. These thoughts are emphasized by the meetings in the two cities—New York and Philadelphia—on the same day and evening last week. In this city the papers read before the American Institute of Electrical Engineers were remarkable in showing the vast strides made in the past ten years, while in Philadelphia a no less cultured and appreciative audience in the Franklin Institute listened intelligently to Prof. Vander Weyde explaining the Phelps system of telegraphing to and from moving trains. The lesson of all this is that in standing as the pioneer of exclusively electrical journalism in America we made no mistake. Fortunes have been made by its study, but there is still room at the top, and we shall always be glad to aid and encourage our younger men to get there. To read intelligently and study assiduously is the only way to genuine success. It is becoming a well beaten track, and the humblest worker should not get lost on the way.

Effects of Magnetization on Iron and Steel Bars.*

BY SHELFORD BIDWELL, M.A., LL.B.

The earliest systematic experiments on the effects produced by magnetization upon the length of iron and steel bars are those of Joule, an account of which was published in the "Phil. Mag." of 1847. Joule's experiments have many times been repeated, and his general results confirmed. In particular, Prof. A. M. Mayer carried out a series of very careful observations with apparatus of elaborate construction and great delicacy. The conclusions at which he arrived were in accord with those of Joule, so far as regards iron. In the case of steel there was some apparent discrepancy, which, however, might to a great extent be accounted for by differences in the quality of the metal used, and in the manner of conducting the experiments. In 1882 Professor Barrett published in *Nature* an account of some experiments which he had made, not only on iron, but also on bars of nickel and cobalt, with the view of ascertaining the effect of magnetization upon their length.

The knowledge on the subject up to the present time may be summarized as follows:

1. Magnetization causes in iron bars an elongation, the amount of which varies up to a certain point as the square of the magnetizing force. When the saturation point is approached the elongation is less than this law would require. The effect is greater in proportion to the softness of the metal.

2. When a rod or wire of iron is stretched by a weight, the elongating effect of magnetization is diminished; and if the ratio of the weight to the section of the wire exceeds a certain limit, magnetization causes retraction instead of elongation.

3. Soft steel behaves like iron, but the elongation for a given magnetizing force is smaller (Joule). Hard steel is slightly elongated, both when the magnetizing current is made and when it is interrupted, provided that the strength of the successive currents is gradually increased (Joule). The first application of the magnetizing force causes elongation of a steel bar if it is tempered blue, and retraction if it is tempered yellow; subsequent applications of the *same* external magnetizing force cause temporary retraction, whether the temper of the steel is blue or yellow (Mayer).

4. The length of a nickel bar is diminished by magnetization, the maximum retraction being twice as great as the maximum elongation of iron (Barrett).

In order that the results of Joule and Mayer might be comparable with those obtained by the author, he made an attempt to estimate the magnetizing forces with which they worked. From data contained in their paper, it was calculated that the strongest magnetizing force used by Joule was about 136 units, while the strongest used by Mayer did not on the highest probable estimate exceed 118 units. In the author's experiments the magnetizing force was carried up to about 312 units. The metal rods, too, were much smaller than any which had been before used for the purpose, ranging in diameter from 1.40 to 6.25 mm. Their length was in every case 100 mm., and the apparatus was capable of measuring with tolerable certainty an elongation or retraction equal to a ten-millionth part of this length.

By using thinner iron rods and greater magnetizing forces than those previously employed, the following curious and interesting fact was established: If the magnetization be carried beyond a certain critical point, the consequent elongation, instead of remaining stationary at a maximum, becomes diminished, the diminution increasing with the magnetizing force. If the force is sufficiently increased, a point is arrived at where the original length of the rod is totally unaffected by magnetization; and if the magnetization be carried still further, the original length of the rod will be reduced. It also appeared that the position of the critical point in steel depends in a very remarkable manner upon the hardness or temper of the metal; considerable light is thus thrown on the apparently anomalous results obtained by Joule and by Mayer. Further experiments disclosed strong reason for believing that the value of the critical magnetizing force in a thin iron rod was greatly reduced by stretching; this would explain the fact that Joule obtained opposite effects with stretched and unstretched wires.

By ascertaining the relative values of the temporary moments induced by gradually increasing external magnetizing forces, an attempt was made to connect the point of maximum elongation with a definite phase of the magnetization of the several rods in which the elongation has been observed.

Though more experiments must be made before it is possible to generalize from them with perfect safety, the results so far obtained by the author indicate the law given below. The elongations and magnetizations referred to are temporary only. Before the beginning of an experiment the rod was permanently magnetized by passing through the magnetizing coil a current equal to the strongest subsequently used. In iron the greatest elongation due to permanent magnetization was generally found to be about one-third of the total elongation, while in nickel the permanent retraction amounted only to about one twenty-fifth part of the whole.

* Abstract of a paper "On the Changes Produced by Magnetization Length in the of Rods of Iron, Steel and Nickel." Read at the meeting of the Royal Society, April 23, 1885.

I. IRON.

1. The length of an iron rod is increased by magnetization up to a certain critical value of the magnetizing force, when a maximum elongation is reached.

2. If the critical value of the magnetizing force is exceeded, the elongation is diminished until with a sufficiently powerful magnetizing force the original length of the rod is unaffected, and if the force is still further increased the rod undergoes retraction. Shortly after the critical point is passed, the elongation diminishes in proportion as the magnetizing force increases. The greatest actual retraction hitherto observed was equal to about half the maximum elongation, but there was no indication of a limit, and a stronger magnetizing force would have produced further retraction.

3. The value of the external magnetizing force corresponding to maximum elongation is, for a given rod, approximately equal to twice its value at the "turning point."

Definition.—The turning point in the magnetization of an iron bar is reached when the temporary moment begins to increase less rapidly than the external magnetizing force.

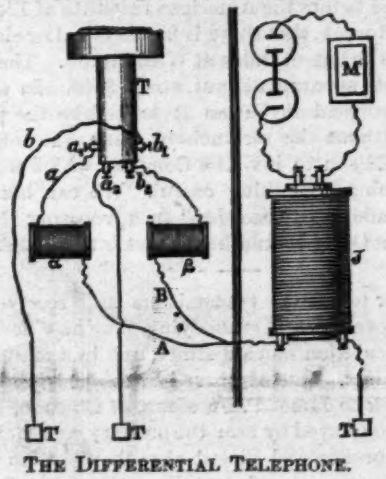
4. The external force corresponding to the point of maximum elongation increases (when the quality of the iron is the same) with the diameter of the rod. So also does its value at the turning point.

5. The amount of the maximum elongation appears to vary inversely as the square root of the diameter of the rod, when the quality of the iron is the same.

6. The turning point, and therefore presumably the point of maximum elongation, occurs with a smaller magnetizing force when the rod is stretched than when it is unstretched.

II. STEEL.

7. In soft steel magnetization produces elongation, which, as in the case of iron, increases up to a certain value of the magnetizing force, and afterward diminishes.



THE DIFFERENTIAL TELEPHONE.

The maximum elongation is less than in iron, and the rate of diminution after the maximum is passed is also less.

8. The critical value of the magnetizing force for a steel rod diminishes with increasing hardness up to a certain point, corresponding to a yellow temper; after which it increases, and with very hard steel becomes very high. There is therefore a critical degree of hardness for which the critical magnetizing force is a minimum; in steel of a yellow temper the value of the critical magnetizing force is lower than in steel which is either softer or harder.

9. In soft steel a strong magnetizing force subsequently diminished may cause a greater temporary elongation than the diminished force is capable of producing if applied in the first place.

10. A temporary elongation when once produced in soft steel may be maintained by a magnetizing force which is itself too small to originate any perceptible elongation.

III. NICKEL.

11. Nickel continues to retract with magnetizing forces far exceeding those which produce the maximum elongation of iron. The greatest observed retraction of nickel is more than three times the maximum observed elongation of iron, and the limit has not yet been reached.

12. A nickel wire stretched by a weight undergoes retraction when magnetized.

The Differential Telephone.

The modifications of the telephone seem to be endless. One of the latest is that of Prof. Fuchs, of Bonn, who has constructed a form of Bell telephone, in which, instead of the customary single wire, two wires of equal length and thickness are wound around the magnet.

In the accompanying illustration the two wires are represented respectively by a and b. The terminals a_1 and a_2 are united to the ends of wire a, the terminals b_1 and b_2 to the ends of wire b.

According, therefore, as the currents traversing the conductors are in the same or opposite directions, the result will be either the sum of or the difference of their effects upon the telephone diaphragm. Hence the apparatus can be employed like a differential galvanometer for the determination of resistance. Prof. Fuchs calls his instrument the differential telephone.

In order to demonstrate with this apparatus the effects due to the acquisition and extinction of magnetism in iron, he made use of the apparatus shown in the accompanying diagram. In the secondary coil J, alternating currents are produced as usual by means of a microphone placed in primary circuit. One of the ends of the primary coils is led to earth; the other end is connected by a wire with a distant room, in which the sound of a music box, placed on the sounding board of the microphone, cannot be heard, and in which also the differential telephone T is situated. Here the circuit divides into two branches A and B, which are reunited to a conductor led to earth. Then the current which leaves one end of the secondary coil passes through the ground (after having passed through coils A and B) and comes back to the other terminal. The branch A contains a coil α and the telephone wire a; while the branch B contains a similar coil β and the telephone wire b. The current traverses the coils around the magnet in opposite directions, and the diaphragm remains motionless, since the effect of the currents is to neutralize each other. If a piece of iron be now introduced into the coil α or β, the sound of the music box will be heard immediately, since the currents induced in the coil by the change in magnetic intensity in the iron traverse the telephone coils a and b in the same direction around the magnet.

[This description, taken from our foreign contemporaries, is interesting, though lacking clearness.]

The Lowell Telephone Suits.

Little else has been talked of in Lowell during the past week besides the three suits brought against the telephone syndicate; but the effect on the market does not appear to have been very great. The Boston *Herald*, taking very much the line of our reference to the subject last week, says: Precisely why the suit was brought is not easy to see. It may be presumed that it was brought in all honesty, and that the plaintiffs consider the course of the defendants actionable. Whether it was will appear later. The relations of a number of Lowell telephone men to each other have been working toward a lawsuit these many months. They may have culminated in this suit, and it may clear the atmosphere, so to speak. Whatever the merits of the controversy, it has always presented amusing as well as serious phases. There is nothing comical about the losses of Lowell men who bought Erie stock of the syndicate, but anybody possessed of a vein of humor may be excused for smiling at the lamentations of those who were the most clamorous to get it.

In connection with the telephone suits the following from the Boston *Traveller* is interesting:

The declarations in the suits against the members of the Lowell telephone syndicate, will, it is expected, be filed within a few days, and although it is not yet known exactly what will be claimed therein, it comes from good authority that the plaintiffs will seek damages on the ground of false representations, by which they were induced to buy the stock of the three companies, which were subsequently consolidated to form the Erie company. They will endeavor to show that these statements, both as regards the value of the stock when the same was purchased, and the earning capacity of the company, were knowingly and wilfully false. The question of the amount paid by the syndicate for the property and franchises of the old Northwestern and Southwestern companies will enter into and become a very important feature of the controversy, as it is alleged by the plaintiffs that there was gross misrepresentation concerning this matter and that they were wronged and deceived thereby. So far as all these charges are concerned the defendants will, in all probability, make a general denial. As regards the earning capacity of the company since its organization, they assert that it has been nearly if not quite equal to their estimates, which, however, were based solely upon facts equally as well known to the plaintiffs as to themselves. For almost a year past the company has been wholly in the hands of the plaintiffs, and if it has not earned as well as they had hoped for, it is, the defendants assert, their own fault. But, as a matter of fact, it has done quite well, as an examination of the figures of the last annual report will show. The net earnings for the year were $220,315, and less the construction, which amounted to $85,172.30, they were $135,143.25. This is nearly 5 per cent. on the entire capital stock of 4,800 shares, reckoned on a basis of 60, the highest figure at which any of the three companies came into the consolidation. On the basis of 55, the figure at which the Southwestern came in, it is over 5 per cent., and if the construction expenses are deducted—and properly they should never come out of net earnings—the net income is over 7¼ per cent., with the stock reckoned on a basis of 60. And, still further, the annual report says: "The net earnings, above all disbursements for the six months ending Sept. 30, 1884, were $52,278.24, and for the six months ending March 31, 1885, $82,865.01." Now, making no allowance for a natural increase in business during the next six months or for the half year ending Sept. 30, 1885, and estimating it to be exactly the same as for the preceding half year, the net income for the twelve months up to Sept. 30 will aggregate $165,730. Adding to this the same amount as was expended last year for construction—$85,172—and the actual net income is shown to be $250,902, or an increase of $30,187 over last year. Now $250,902 amounts to over 8½ per cent. on the stock

reckoned at 60, and to 9¼ per cent. on a basis of 55. Telephone enterprises have, as is very well known, not developed as well of late as had been hoped for, and no one is more grievously disappointed on this account than the projectors thereof. This is especially true in the case of the Erie company, but here, as is shown by the figures given in its report and cited above, the cause for complaint is comparatively light. The requirements of the construction work and the adoption of a policy that would, as it was supposed, best conserve the interests of all concerned, were the influences that tended, in common with other corporations, to bring about a suspension of dividends.

But in spite of this fact, and in spite of the depreciated market value of the stock—which is oftentimes a poor criterion of the intrinsic value—the company, from its own statement, seems to have done comparatively well of late. If there has been fraud, nobody has been in a better position to know of it than the plaintiffs in these suits, and, if there has been no fraud, and if their claims are grounded solely on what has thus far been given out in a general way, their chances for recovery would seem to be slight. Messrs. Ingham, Downs, Glidden, Bent and Coburn all express their intention of fighting the case out, and settling the matter once and for all, for any compromise, even if such a thing were possible under the circumstances, would only tend to open the way to numerous other claimants, who might, with equal justice, set up the claim that they, too, had been defrauded. With all the color of right that the plaintiffs may show in their respective cases the fact that they have set their ad damnum at so high a figure—an aggregate of $135,000—when it is next to impossible for them to recover anything like that amount, and the further fact that they have attached property, real estate and personal effects, largely in excess even of the aggregate ad damnum, and much to the inconvenience and embarrassment, personally, of the defendants, has certainly created a feeling in certain quarters, at least, that the whole litigation has been instigated by malice, and is directly or indirectly the outgrowth of the bad feeling that has long existed in the directory of the corporation. Some very interesting developments in connection with the past management of the property are probable before the controversy is finally ended.

Telegraph and Telephone in Illinois.

At Springfield, Ill., on May 19, the State Senate passed a bill licensing telegraph companies. It provides that every corporation, whether incorporated or organized, or residing in the State or outside of the State, operating a telegraph line in the State, shall make an annual report to the auditor of public accounts before the 10th day of January each year, which report shall state the number of miles of telegraph operated in the State, and the amount of gross receipts from all sources of their business received within the State for the year ending on the 31st of December preceding such report. It shall not be lawful, after the 10th day of January, 1886, for any company to transact the business of telegraphing without making a report, and procuring from the auditor a certificate authority or license; and it shall be a condition precedent to the issuing or renewal of the annual certificate or license by the auditor that the company making the statement shall pay into the State treasury 3 per cent. of the gross amount received by the company within the State for the year included in the report, which sum may be recovered in any court of competent jurisdiction at suit of the State.

Exhausting the Air from Incandescent Lamps.

One of the most important processes in the manufacture of incandescent lamps is that in which the air contained in the bulbs is exhausted so as to leave the filament in a vacuum. It is evident that carbon heated to incandescence in the presence of the air or oxygen must be consumed and converted into carbonic acid gas, and hence to preserve the carbon filaments intact the air must be removed from them. This was recognized at a very early date, even before the incandescent lamp was thought of. Davy, in experimenting with the arc light, placed two pieces of charcoal under the receiver of an air pump and thus prevented their consuming by combustion. He also experimented with gases which do not support combustion, such as nitrogen, carbonic acid gas, and others, and in this he was followed by other experimenters. Although he did not prevent the wasting away of the carbons by removing the air, he nevertheless lengthened their duration considerably.

The vacuum being evidently of vital importance to the life of the carbon filament incandescent lamp, it becomes necessary to devise means for producing it in a quick and thorough manner. Where but a few receptacles are to be exhausted of air, any of the old, well-known methods can be advantageously employed; but to perform this work upon thousands of incandescent lamps, special arrangements must be devised to do it as effectually and rapidly as possible, in order to reduce the expense of manufacture. The introduction of the incandescent lamp, which first created a demand for such an apparatus, has called forth a large number of different methods devised by various inventors. Many of the processes are quite elaborate. Evidently the less manipulation required in such an apparatus, the quicker will be its operation; and the apparatus can be left in the hands of comparatively unskilled persons. One of the most simple arrangements in this respect, and at the same time most effective, is that employed by Mr. Weston for the exhaustion of his incandescent lamps.

The process of exhaustion, although a simple operation, must be conducted with great care, and certain precautions must be taken so that the filament is left in the best possible condition for a long life.

Our illustration, Fig. 1, shows the arrangement by which forty lamps are exhausted at the same time, the only manipulation required being the turning of a cock to and fro until exhaustion is complete.

Taking up first that part of the apparatus which belongs to the exhaustion pure and simple, we find two air-pumps, one on either side. The one on the left hand, it will be noticed, is connected with a pipe which runs horizontally along the top of the boards supporting the bulbs, and to this pipe all the left-hand bulbs are connected by tubing. In the same way, the right-hand air-pump connects with a pipe which runs a little above the former, and to which all the right-hand bulbs of the respective pairs are connected. By referring to Fig. 3, which is an enlarged view, this will appear more distinctly; the left-hand bulb, as shown by the dotted lines, is connected to the lower pipe, and the right-hand bulb to the upper pipe.

Before entering into the description of the action, we will describe the details of the apparatus. There are two bulbs, one placed about 8 inches above the other, and, as shown, connected by a U-shaped tube. The bulb at the left connects directly with the pipe leading to the air-pump, but from the top of the right-hand bulb the glass tube is bent in the shape of a U, then enlarged into a second smaller bulb, and connected with the pipe leading to the other air-pump. This small U is filled with mercury and acts as a seal.

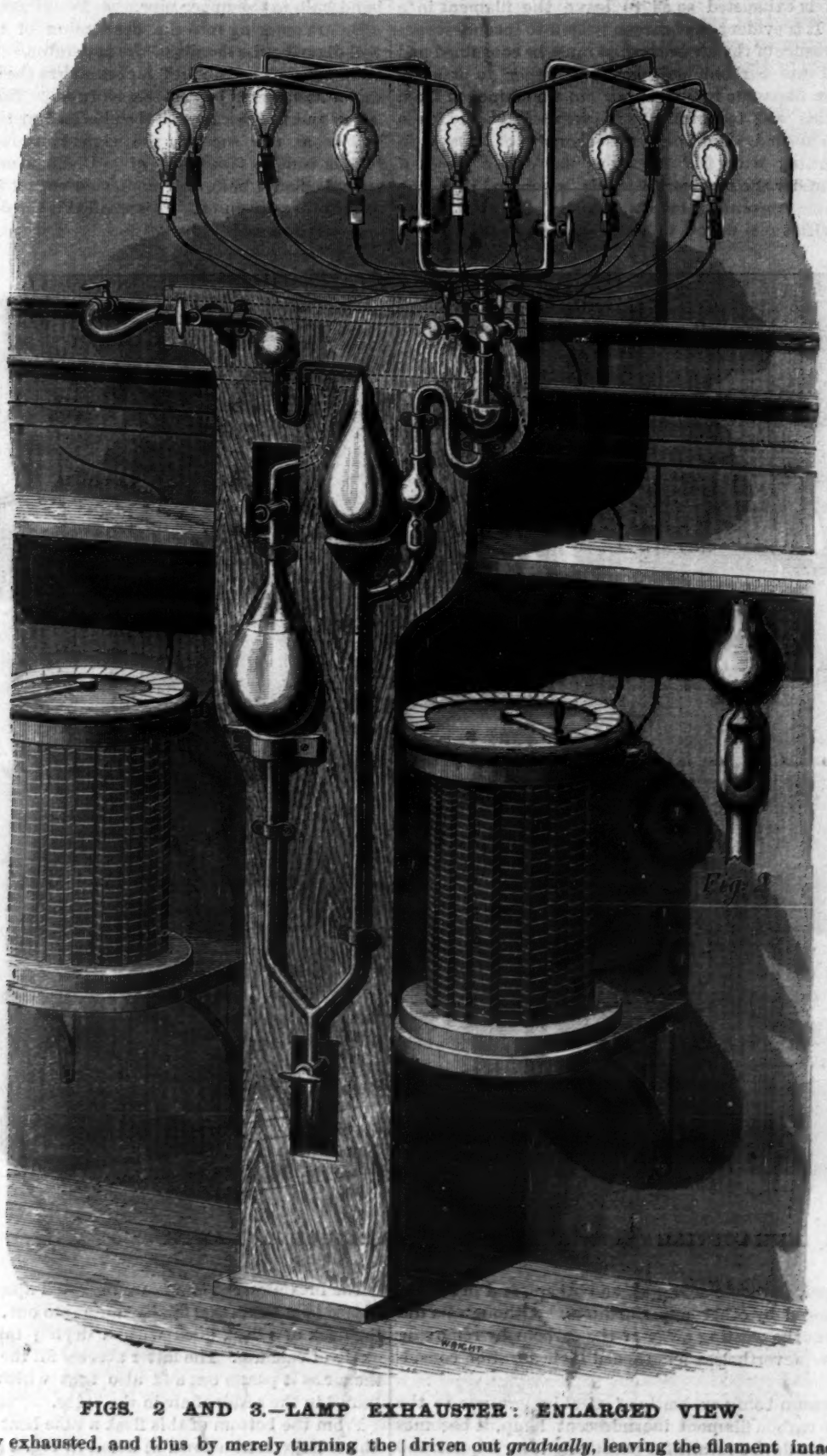
FIG. 1.—APPARATUS FOR EXHAUSTING THE AIR FROM INCANDESCENT LAMPS.

The incandescent lamps are mounted upon the branches of two bent tubes that finally unite into one, which fits into the neck of a flask filled with a drying mixture, such as oxide of calcium. The latter absorbs all the moisture from the air as it passes out and also that which may be contained in the residual air in the bulbs.

From the bottom of this flask a tube bent twice leads to the enlargement shown in detail in Fig. 2 (within Fig. 3). This contains a small float, which is raised by the mercury and closes the tube, so that no air can enter it from below. Its action is similar to that of a check valve, as it permits the exhausted air to pass out, but forms a barrier to its re-entrance. Finally, the float compartment is connected, as shown, to the main tube a little below the right-hand bulb. It must also be added that, as shown in Fig. 1, the pipe leading to the air-pump at the left, and connected with the corresponding bulbs, is provided with a three-way cock, so that these bulbs can be put alternately in connection with the air-pump and with the open air.

The operation of the apparatus depends upon the rise and fall of the mercury, which is shown in the engraving (Fig. 3) to fill the lower bulb and to stand at the same level in the U-tube. Both air-pumps being set to work, the three-way cock is opened to the air and the cock at the end of the tube leading from the upper bulb is opened so that the air is exhausted from the top of the latter. This creates a vacuum and the mercury begins to rise, drying out the air before it through the U-shaped seal. As soon as it begins to rise, however, it enters the branch

to the right and raises the float, so that no air is forced back to the incandescent lamps. The position of the bulbs and the quantity of mercury are so regulated that when fully risen, the mercury just reaches the horizontal branch leading to the seal and overflows a trifle so as to drive out all the air through the seal. We now have a *vacuum* on one side (since the upper bulb is permanently connected to the air-pump) and *air pressure* on the other lower bulb. The three-way cock is then turned so as to put the latter in connection with its air-pump; this creates a vacuum on that side also, and the pressures now being equal in both bulbs, the mercury begins to fall until it is level, as at the beginning. As it falls it releases the float, and the air in the lamps expands and fills the upper bulb. The three-way cock is now again opened to the atmosphere, the mercury rises as before, raises the float, and drives out the air in the upper bulb. This operation is repeated until the air is sufficiently exhausted, and thus by merely turning the three-way cock the mercury is raised and lowered and performs the work of exhaustion.



FIGS. 2 AND 3.—LAMP EXHAUSTER: ENLARGED VIEW.

It is evident that by this method there is, theoretically, no limit to the number of lamps which can be exhausted at the same time, as any number of frames can be connected together to air-pumps of sufficient size to perform the work of exhaustion when the cock is turned.

It is also apparent that, although in connection with the apparatus, the air-pumps do not perform the real work of exhaustion. Their office is merely to maintain vacuums respectively on the outside of the seal and as required in the lower bulb. The mercury could evidently be made to rise and fall by raising and lowering the lower bulb through the proper distance, and in one of the first forms of the apparatus this was actually resorted to. Hence the air-pumps only act as a mechanical power to give motion to the mercury and to facilitate the operation, so that the only work required by the attendant is the turning of the three-way cock.

As stated before, the filaments also undergo treatment during the process of exhaustion for the purpose of driving out the occluded gases contained within them. Were this not done, the lamp when put in service would be rapidly destroyed by the expansion of the gases within, which would burst out and disintegrate the carbon completely.

In order to avoid this, the lamps, as shown, are connected by clips and wires to two terminals which receive current from a dynamo. In the lamp circuit is placed a rheostat so that the current passing into them can be regulated by turning the handle of the resistance coil beside each frame. At the beginning of the exhaustion, a weak current is passed through the lamps so as to heat them but slightly. As the exhaustion proceeds, however, the current is increased until at the end the lamps are brought to a state of incandescence far beyond that for which they are normally designed. Thus the occluded gases are driven out *gradually*, leaving the filament intact and free from fissures in its texture.

When this point has been reached the lamps are ready to be taken off the branches. This is done by fusing the glass at the top of each bulb and gently drawing the lamp so that the glass flows together without permitting the air to enter.

This ingenious apparatus works with the greatest smoothness. It requires only one attendant, who controls the three-way cock, adjusts the rheostats and inspects the lamps during the process.

The Condition of the Postal Company.

Henry Rosener and Albert B. Chandler were appointed receivers of the Postal Telegraph and Cable Company by Judge Lawrence on May 23. Both of the gentlemen named have been connected with the management of the company for some time, and their appointment as receivers is in accordance with the wishes of the persons in control, who desire to smooth the way for a successful consummation of the reorganization scheme. In June last the Postal Company, by its first vice-president, George S. Coe, and its treasurer, George S. Hart, made a promissory note for $100,000, payable on demand to the order of Mr. Rosener, its second vice-president and general manager. The note was indorsed and assigned by Mr. Rosener to C. C. Brown & Co. It was not paid on demand, and in the latter part of April its holders began a suit on it. The company made no appearance in the action, and on the 15th inst. judgment was entered against it for the sum of $105,368.45. An execution was issued on the same day, and was returned unsatisfied the following day. A sequestration suit was at once begun, and E. B. Convers, attorney for C. C. Brown & Co., obtained an order to the company to show cause why a receiver should not be appointed, because it was insolvent. At the hearing before Judge Lawrence, John Cummings, who appeared for the company; Andrew Wesley Kent, who represented John W. Mackay; George S. Coe, George S. Hart and other bond and stock holders, and some unsecured creditors and Deputy Attorney-General Charles H. Hall joined with Mr. Convers in suggesting the appointment of Messrs. Chandler and Rosener as the receivers.

An officer of the company states that John W. Mackay owns about three-fifths of the company's assets, and that the money needed to make the reorganization a success would be furnished by Mr. Mackay. It is proposed to recapitalize the company at $5,000,000 and have no bonded indebtedness whatever. It is desired to have the holders of the $10,000 000 of bonds accept in lieu thereof 35 per cent. of their par value in new stock. The $10,500,000 of old Postal Telegraph and Cable stock will be allowed 5 per cent. of its face value in new stock, and the $700,000 of floating indebtedness will be paid for in the new stock at the rate of $105 for each $100. Under such a scheme of exchange $4,760,000 of new stock will be issued, leaving $240,000 of the $5,000,000 in the company's treasury. It is claimed that the holders of more than $8,000,000 of bonds have given their assent to the reorganization plan. The new receivers assumed charge of the company's affairs at once. It is expected that Mr. Mackay will be in this city between the 15th and 20th of next month.

The American Bell Petition.

Last week we stated that the committee on mercantile affairs, to whom was referred the petition of the American Bell Telephone Company for an alteration of its charter in respect of that provision thereof which limits the amount of its capital stock, had considered the same, and submitted a report thereon recommending that the petition be withdrawn. Subjoined is the full text:

The chief reason given for an increase of the capital stock of the company was for the purpose of building and operating new lines of wires which should connect with the present exchanges in the principal cities of the country in a way that would enable persons to communicate between distant points, as between Boston and New York, Philadelphia or Washington. It seems to be clearly established that it is practicable to converse by use of the telephone for a distance as great as that between the above-mentioned cities, and perhaps much farther. But the success of long-distance telephoning has not yet been demonstrated, and it was not shown before the committee that the work of building such lines would be undertaken only as the business from time to time and from place to place should be proved to be a commercial success. That the building and operating of such lines would probably be of great public utility we are satisfied, but we think the duty first rests upon the company to make it practically certain by actual demonstration that the business is likely to prove a success, by establishing lines for actual business between two or more of the principal cities before any increase of capital is granted. For these reasons mainly, we therefore recommend that the petitioners have leave to withdraw.

A Telephonic "Ghost Story."

"Have you noticed that a great many men and some young girls are going about lately with misshapen ears?" asked a well-known physician of a Philadelphia reporter.

"No," was the reply. "What causes it?"

"Why the telephone, to be sure."

"The telephone; how?"

"Well, you see, the handy little instrument is in almost universal use in mercantile, financial and business circles generally, and all people connected with the store or office resort more or less to its use. Instead of applying the receiver gently to the ear, most of them pick it up hurriedly, clap it to the side of their head and bellow lustily. Now this has a tendency to gradually spread out the appendage and flatten it against the side of the head. The change in the exterior of the organ is as yet almost imperceptible, but consider what such frequent rough applications to a tender portion of the anatomy will do in time. In the course of a generation or two, if something is not done to remedy the evil, I prophesy, sir, that we will be a nation of elephantine auricles. For some this might be considered no hardship, for we could determine at once what might take us some time to find out. But if you have any consideration for the happiness of your friends and children, warn them to be careful in the use of the telephone," and the M. D. shook his head solemnly and wisely as he went on his way.

An Electric Dumb-Bell.

The object of the novel instrument illustrated on this page is to effect a stimulation of the nerves simultaneously with the exercise of the muscles. We may state here that when holding the electrodes in the hands quietly, the most marked contraction is generally produced in the muscles of the forearm. When, however, the arm is moved about, as in dumb-bell exercises, the result is a constant change in the effect upon the muscles, all of which are more or

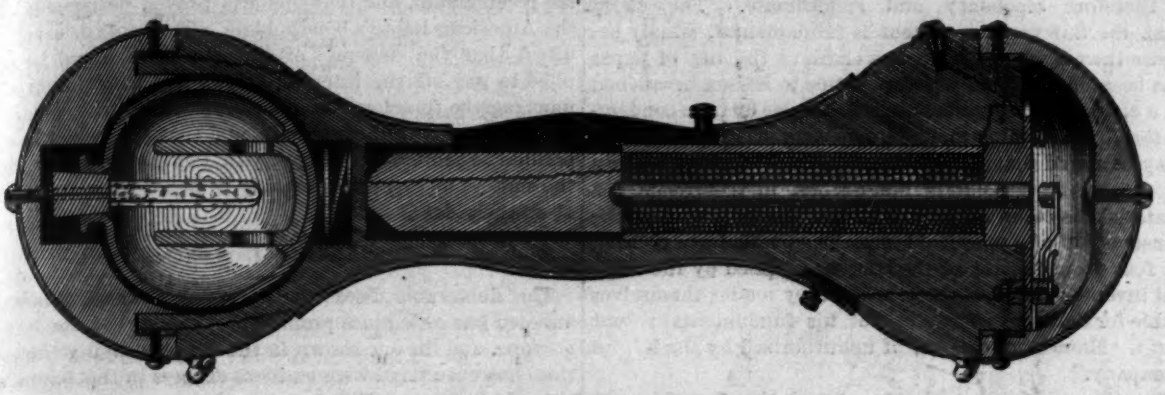


FIG. 1.—AN ELECTRIC DUMB-BELL.

less affected according to the position of the arm. By the use of the dumb-bell shown in the accompanying illustration, this desirable result is obtained by inclosing an induction coil and battery within the dumb-bell, so that it performs the functions of both muscular and nervous stimulator at the same time. The construction of the apparatus is quite ingenious, as several important conditions must be met in order to attain success.

As will be seen, the handle of the dumb-bell is cored, and has an induction coil fitted at its right end. At this end also the vibrator will be noticed, whose purpose is interrupting the primary current.

Evidently an instrument subjected to such rough usage as that of a dumb-bell must be furnished with a battery of special construction, and this has been provided for in the cell shown inclosed in the left-hand bulb. This consists of a

FIG. 2.—PHYSICIAN'S POCKET BATTERY.

hard rubber flask, into the bottom of which a cylindrical carbon is fixed. A platinum loop imbedded in the carbon passes through the bottom of the flask and makes contact with the spring pressing against it. The rubber stopper of the flask has a zinc rod screwed to it and a connecting wire running through it to the knob on the top. Thus when the cell is placed in position the spring pressing against the bottom makes contact at that point and also presses the top of the stopper against the upper terminal, and completes the circuit so far as the battery is concerned. The fluid used is bisulphate of mercury, and the cell, as seen, not being rigidly attached, can be taken out, inspected and refilled by turning the hemispherical cap which forms the end of the bell. The right end of the bell is also covered by a removable cap which allows inspection of the vibrator.

The slide, provided with a knob and situated at the lower side of the bell, serves to make or break the battery circuit. Thus the electric impulse can be stopped by a motion of the finger. Again, the intensity can be varied as in the ordinary way by drawing out the damper or graduating cylinder, which is connected to the knob near the centre of the handle. Besides this method of graduation, three strengths of current can be obtained, as usual, by connecting respectively to the terminals at the ends and to that in the top of the right-hand bulb.

In use, this dumb-bell is connected to another, which, however, is only provided with electrodes at the handle, so that the current is passed through the body as in the ordinary manner.

In addition to its use as a muscle-exerciser, the instrument can evidently be employed as an ordinary induction coil, as shown in Fig. 3.

This instrument is made by the Smith & Shaw Electric Company, of 168 West Thirty-fourth street, this city, who also manufacture a very compact battery for physicians' use, which is contained within a space of $7\frac{1}{8}'' \times 3\frac{7}{8}'' \times 1\frac{1}{4}''$. This, as shown in Fig. 2, contains the coil, interrupter and the various forms of electrodes. The two cells shown in the left-hand corner of the case are similar in construction to that of the dumb-bell above described, and the mere placing of them in position puts them also in circuit.

New Cables in New York Harbor.

On Sunday, May 24, the fifth armored cable of the Baltimore & Ohio Tel. Co. was laid across the Narrows, New York Harbor. The scow with the cable on board was towed to the place, and the foreman, Mr. Chas. Mason, with seven of his men immediately went to work to run the cable on shore and make the connections with the air line, as well as to firmly anchor the cable preparatory to starting across the Narrows for Fort Wadsworth, where the other end of the cable was to be connected.

Mr. J. W. McLaren, manager of the Baltimore & Ohio, arrived shortly after 9 o'clock, but, owing to the low tide and the tug getting aground, some two hours was lost before a start could be made. Finally, however, the tug pulled out, and in a very short time the end of the cable was at the other side of the harbor, and in an hour or two more the splices were all made and the cable was ready for business. The cable is one of Mr. Day's make, and composed, as usual, of 8 No. $18\frac{1}{2}$ copper wires, insulated to 9-32 of an inch, firmly packed and wound with jute, and armored with 18 No. 4 galvanized armor wires made specially for this purpose.

Telephones and Lightning Arresters.

To the Editor of The Electrical World:

SIR: Please inform me through your valuable journal if there is any danger to a person using a telephone, with or without lightning arresters, during a thunder and lightning storm. F. E. A.

BROOKLYN, N. Y.

[There is always "danger." When well provided with lightning arresters, there is less danger, according to the efficiency of the system employed. It is well to keep at a respectful distance from all massive and lengthy conductors during a severe thunder and lightning storm.—EDS. E. W.]

The Edison Effect.

To the Editor of The Electrical World:

SIR: Referring to a late number of THE ELECTRICAL WORLD, please tell me: 1. What candle-power the No. 4 lamp was, described in the article "Edison Effect."

2. Also why do the carbon particles spoken of deposit on the platinum plate? One would think that the discharge, if any, would be in the opposite direction, or from the platinum to the carbon. RALPH.

ANSWER.—1. By referring to the column of remarks, given with the table, it will be noted that the lamp was normally of 8 candle-power.

2. Our issue of March 21, 1885, contains a description of the experiments on the Edison effect, embodied in a paper read by Prof. E. J. Houston, at Philadelphia, in October, 1884, before the American Society of Electrical Engineers. The discussion of the paper, which we give at the end, brought out the same question which you ask, and we therefore refer you to that number for further information.—EDS. E. W.

Plating Room Connections.

A few simple rules regarding the operation of a plating plant will, no doubt, interest a great number of our readers. We therefore give, with the illustration, the following, issued by Messrs. I. W. Colburn & Co., to accompany their machines:

Run the machine from a counter-shaft in the direction indicated by arrow.

Set the brushes *B B* parallel to each other and to the commutator *C*, projecting them a uniform distance from brush-holders far enough to prevent being caught by reversing direction of machine, and bearing not too heavily on commutator. A little practice will enable you to set the brushes so that when the machine is doing its maximum work there will be no spark at commutator, and consequently more power and less wear on brushes and commutator shell. A little lubricating plumbago mixed in a paste with a little lard or sperm oil, and applied with a wad of chamois leather in a very small quantity to the revolving commutator, will make the commutator run smoothly. Do this as often as a tendency to spark is noticed. Copper dust flying from brushes shows want of oil.

When running several solutions the arrangement shown in the cut of plating room will be found convenient, the wires running from main rods to tanks, as shown. The binding-post on machine marked *P* is connected to rods connected to anodes, and *N* to rod connected to work rods. The rods on tank should be kept bright with emery cloth.

When but one tank is used, connect directly in same way after getting the speed of machine satisfactory for the maximum amount of work. The current may be decreased for small surfaces by moving the handle from strong point marked *Z* on resistance board, one button at a time until it is found to answer. The horizontal position of brushes, as shown in cut, is the strongest point; by eleasing set-screw *A*, and moving to right or left, the current is diminished. A slight change of position of the brushes is sometimes an advantage in setting brushes when running on large surfaces.

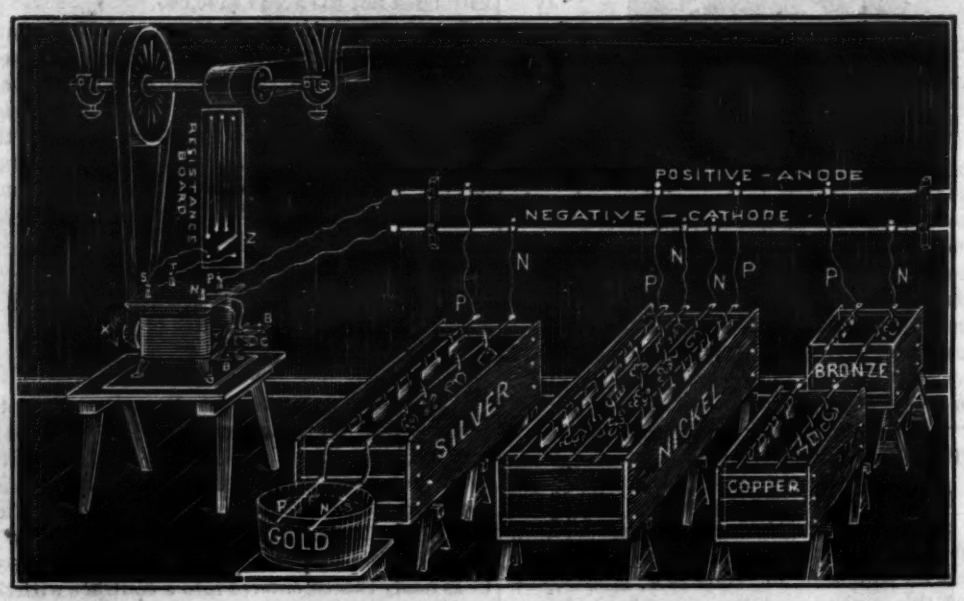
FIG. 3.

Resistance is used to prevent burning of work which renders it difficult to polish. If wires are connected together from screw cups on *N* and *P*, machine will not work, as this short-circuits the dynamo. Neither should any wire connect the two conductors together, as the current will flow on the connecting wire in preference to flowing through vat.

The proper current for nickel-plating on brass or other smooth surfaces is where the gas is seen to adhere to the work and no tendency to blacken edges. If the speed of machine is found too high, a sleeve of leather or wood may be put on the pulley.

Polish the commutator every morning by holding upon it, while revolving, a piece of finest emery or crocus cloth, and clean out divisions of commutator with stiff card. If brushes become ragged, trim off so that the cut end does not touch commutator; when other leaves are worn out, cut in same way, when brushes may be moved forward. See that machine is properly oiled, and that belts leading to countershaft do not slip so as to cause irregular power when machine is doing a large amount of work.

Cone pulleys may be used to vary speed. Keep all connections bright and clean, as well as anode rods and connections.



PLATING ROOM CONNECTIONS.

The "Curt" Battery.

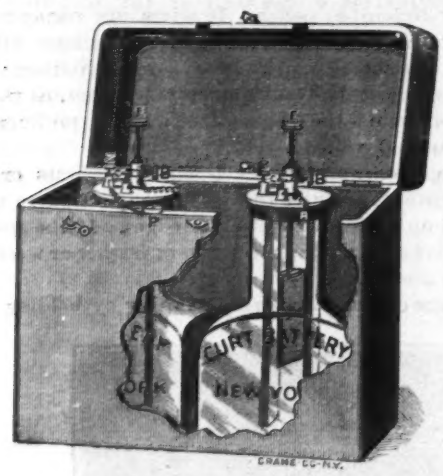
The Grenet battery, which has been so long and favorably known, while giving good results in its way, is nevertheless, as ordinarily made, open to some objections, and it was to remove these that the battery shown in the annexed engravings has been designed.

In the first place it will be noticed that though occupying no more space in the box than the Grenet round cell, the "Curt" No. 1 contains nearly twice as much fluid as the other, and exposes a surface of electrodes, both carbon and zinc, which is equal to that of the No. 2 Grenet; hence there results a current of greater quantity and duration from a battery of equal outside dimensions.

Added to this the lower half of each carbon is corrugated, and to prevent corrosion of the broad metallic flanges to which the carbons are attached, the upper ends are saturated with paraffine. The brass flanges, where they make connection with the carbons, are covered with a sheet of platinum so that no corrosion can take place, leaving the contact unimpaired. The other surrounding parts are given a coat of asphalt varnish. The carbons are not soldered, but screwed on, and a new one can be attached at a moment's notice.

Another improvement introduced is the hard rubber cap, which does away with all metallic mountings around the neck of the jar. In order to accomplish this, the "Curt" battery is provided with a groove around the upper part of the jar, into which fits a flexible rubber ring. This holds a solid, hard rubber cap firmly, and closes the jar hermetically.

As the metallic mounting is done away with, any fluid destructive to metals may be used, such as bisulphate of mercury solution, producing a very continuous current for electric light or cauterizing purposes. In the ordinary Grenet battery this fluid cannot be used without destruction to the metal mounting on top of the jar.



Another point worthy of note is the rod supporting the zinc. This, for convenience of transportation, is made in two sections, the upper one screwing into the lower.

Two of these cells, which are made by Mr. Curt W. Meyer, of this city, are calculated to furnish the exact amount of current to light a 3-ohm incandescent lamp for medical purposes, and develop its full illuminating power, without danger of destroying the carbon filament of the lamp from too strong a current.

The Edison Priority Claims.

The Edison Electric Light Company, of this city, issued the following circular on the 23d inst., in regard to their legal claims to certain patents:

"*First*—That the patents of Mr. Thomas A. Edison, now the property of this company, fully cover the exclusive manufacture, sale and use of any and all practical incandescent electric lamps.

"*Second*—That the Edison Company, having begun suits at law for the enforcement of its rights under these patents, will not relax in their vigorous prosecution.

"*Third*—That the Edison Company is prepared to fully guarantee and protect all its customers, and to prosecute and punish, to the full extent of the law, all makers, sellers, or users of incandescent lamps not duly authorized by it.

"The late attempt to establish for the Sawyer-Man patent, just issued, a fundamental character is made upon wholly superficial ground, and will not bear the test of close analytical examination. Edison's patent of January, 1880, applied for at the time of his great discovery, covers broadly all the elements of that discovery, and is therefore fundamental and controlling. The Sawyer-Man patent, constructed in the light of the knowledge of 1885, but having for its foundation unsuccessful laboratory experiments, only covers certain details of manufacture of carbons, as, for instance, paper and the specific genus of material to which it belongs, and is therefore secondary and subordinate. The claim that the Sawyer-Man patent is fundamental, simply because the narrow and valueless claim to the use of paper has been illegally and without notice to Edison broadened to a claim for all fibrous material, carries its own condemnation. If anything more is necessary to demolish it, it may be stated that Edison, Swan, and others have already used material absolutely non-fibrous, in preference to a material the claim for which is now held to control the construction of a practical lamp. The public have nothing to fear from the use of the lamp as supplied by the original inventor and discoverer, while they render themselves liable for damages by the use of his fundamental patent for a 'filament of carbon,' if unauthorized by the Edison Company."

The Sawyer-Man patent referred to is that for which application was made on Jan. 9, 1880, and which has just been allowed. Its claims were cited in our last issue.

Sugar Refining by Electricity.

A statement, originating with an English contemporary, has recently been going the rounds of the press that a process of refining sugar by electricity had been discovered by one Henry C. Friend, of New York. According to the report, the process is dry throughout, dispensing altogether with boiling and the use of bone-black. No syrup whatever is produced, but the whole product is hard sugar of nearly, if not quite, absolute purity, namely, 100 per cent. cane sugar, as per analysis. A principal feature of the process is the use of electricity, concerning which the inventor claims he has discovered a new manner of producing it at a nominal cost. He claims, and is said to have proved, the following points (the demonstrations he has made have been with parcels of sugar from 10 pounds in weight up to over 2,300 pounds, and the qualities of the raw sugars refined have been various, including beet root, second quality, Java stroops, and such low grades): The process of conversion does not take, in point of time, more than four hours; and the production once commenced, the output of the refined sugar is continuous so long as the raw material is supplied. The cost of the process will not exceed 80 cents per ton, this being the price arranged by contract with Professor Friend, to the performance of which he pledges all his interest in the company; and the product upon analysis will show not less than 99.50 per cent. of pure sugar. Any description of refined sugar can be produced from the finest powdered up to and including cut and pressed loaf; and the profit in the working of this process will not be less than $25 per ton of 2 240 pounds. The cost of the machinery required to produce at the rate of 4,000 barrels of refined sugar per day of twenty-four working hours, together with the power requisite to run the machinery, and all the attendant apparatus for handling it up to the point of its being put into barrels, and the fitting of a suitable building to receive and work the machinery, is estimated not to exceed $100,000.

In order to obtain some more authentic statement regarding the nature of the process employed, we made inquiry at the office of the company exploiting the invention. But although receiving visitors courteously, the officers of the company refused to divulge the nature of the process, further than that it fully came up to the results given above. We were shown several samples of sugar of all sizes, said to be the result of the electric process.

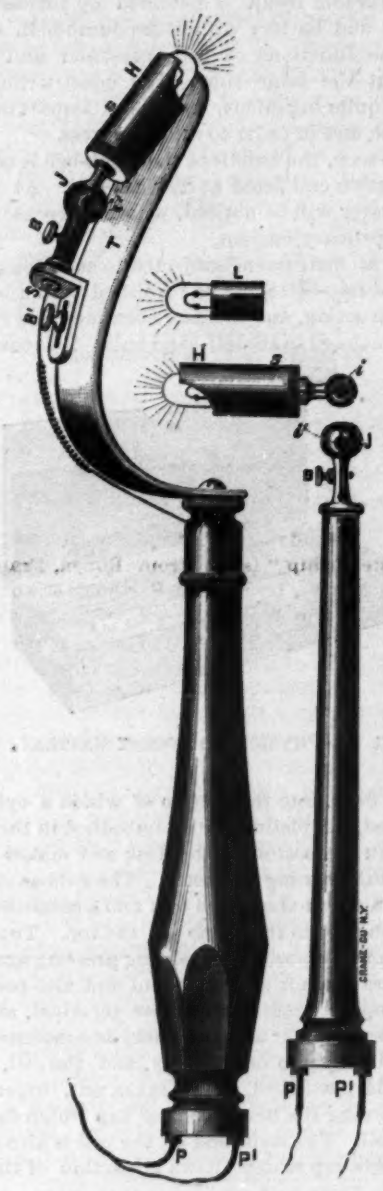
We can, of course, express no opinion in the light of the above secrecy, but it would be interesting to know what is the "new manner" by which the inventor produces his electricity at a nominal cost.

The Rapid Telegraph Company.

Counsel for the Boston Safe Deposit and Trust Company have filed a bill in equity in the United States circuit court, Philadelphia, against the American Rapid Telegraph Company, doing business in Pennsylvania, in which the former asks to have a receiver appointed for the latter. The bill sets out that in August, 1883, the American Rapid of Connecticut, the parent of six other corporations in as many States, entered into a contract with the Bankers & Merchants' Telegraph Company of New York, whereby the last named agreed to construct for the American Rapid company lines connecting a number of cities with the American Rapid's system, including the defendant's line, and as payment and security for the Bankers & Merchants' outlay, the American Rapid Company of Connecticut issued bonds to the amount of $3,000.000 bearing 6 per cent. interest, secured by mortgage on property in the States named to the complainant company as trustee; that default in the payment of the interest on the bonds has been made to the extent of $180,000, and that suit was brought in the Circuit Court of Connecticut for the purpose of foreclosing the mortgage, and to have receivers appointed to take charge of the mortgaged property, which suit is now pending; also, that on the 18th of April last, Edward Harland was appointed receiver of that portion of the American Rapid's lines doing business in the State of Connecticut. The bill then goes on to state that, although the Bankers & Merchants' Telegraph Company has been placed in the hands of receivers, the American Rapid of Connecticut has permitted such receivers to continue in the control of the latter's property and business, and apply its earnings to the expenses of the receivership, and that this has proved detrimental to the American Rapid's bondholders. The court is asked to direct that the revenues of the American Rapid be applied to pay off the interest due on the bonds, that the mortgage be foreclosed and the proceeds of the sale used for the payments of the bonds, and that a receiver be appointed to protect the property in Pennsylvania pending the suit. The case will probably be heard upon argument at an early date.

A New Electric Laryngoscope.

The deplorable disease with which General Grant is afflicted has called into prominence the use of the laryngoscope, and the one shown in the accompanying illustration has been tried with eminent success in the examination of his throat. This instrument was recently devised by Mr. Curt W. Meyer, of this city, and its distinguishing feature is the tongue-depressor *T*, to which an insulating handle is attached and to which the conducting wires are affixed.



ELECTRIC LARYNGOSCOPE.

The lamp is surrounded by a shield, which is a non-conductor of heat. The lamp is secured in the ball joint *J*, on the slide *S*, and can be moved and clamped in the proper position by the screw *B*.

The addition of the tongue-depressor allows the examiner to displace the tongue effectually, for which purpose the end of the depressor is slightly roughened in order to obtain a good hold.

Accompanying the laryngoscope is shown a universal illuminator. The same lamp can be used in both instruments, and, as shown in the detail, can be extinguished by merely turning the hood *H*. This brings the two contact points opposite the insulating centres *i*, by which means the circuit is broken.

The Photometric Valuation of Intense Lights.

The complete determination of the photometric value of intense sources of light, such as the electric arc or the sun, requires (1) the comparison of two lights of different tints; (2) evaluation of the tint by means of a numerical factor; (3) the determination of the photometric ratio of the intense source in terms of a relatively feeble standard. M. Crova, the eminent French astronomer, has, reports *Engineering*, recommended the employment of a solution of perchloride of iron and chloride of nickel in the comparison first enumerated. The photometric screen is to

be regarded through these solutions. The method was originally proposed by him in 1882, and has since been adopted by many physicists. The solution now preferred is:

	Grammes.
Anhydrous perchloride of iron (sublimated)	22.321
Crystallized chloride of nickel	27.191

dissolved in distilled water, forming a total volume of 100 cubic centimetres at 15 degrees Cent., care being taken to prevent reduction of the perchloride of iron. A thickness of 7 millimetres of this solution only allows wave lengths of from 630 μ to 534 μ to pass. M. Crova has also shown how the spectro-photometer enables the temperature of a luminous source to be expressed in arbitrary degrees. In practice the tint can be easily represented by means of two successive photometric determinations; one obtained in regarding the photometric screen of Foucault across a solution permitting 580 μ rays to pass, gives the ratio of the intensities; the other made by placing before the eye a piece of red oxide of copper glass, which allows to pass rays from 726 μ to 752 μ, gives a ratio as much below the preceding as the tint of the light is whiter than the carcel. The quotient of the first determination and the second enables the tint to be characterized. It is greater as the light is white, equal to one for sources of the same tint as the carcel, and for an incandescent electric lamp it has varied in M. Crova's experiments from 1.05 to 1.23, according to the intensity of the current, while the luminous intensity rose from 1.1 to 3.2 carcels. These intensities are expressed in function of the Violle standard light adopted by the Congress of Electricians, by dividing by 2.08. For arc lamps the coefficient which represents the tint is still greater. It has attained values from 1.5 to 1.7 in the conditions under which M. Crova has worked; that is to say, with a Serrin regulator burning Carré carbons of 12 millimetres in diameter, and giving a light of from 230 to 320 carcels, with an electrical energy expended between the points of 150 to 166 kilogrammes per second. It is probable that with a still more powerful light the tint would be represented by figures still higher. With sunlight the tints are represented by numbers growing with the height of the sun, and higher than those above given. These numerical factors of M. Crova are useful in a practical sense, because they enable an observer to reproduce the tint, and once ascertained for a particular incandescent lamp, they enable the engineer to regulate the current until that degree of incandescence is reached.

How Shall "Liberty" Enlighten the World?

News has already been published by cable of the departure of the steamship "Isere" from Rouen, France, for New York, on May 21, bearing the Bartholdi statue of "Liberty Enlightening the World," presented to this nation by the people of the French Republic. The departure of the vessel was made the occasion of rejoicing, and all the civil and military authorities of the city assembled to witness the event. Before another week passes, the "Isere" will have arrived in New York harbor, ready to unload her precious cargo; and then as soon as the pedestal has been raised on Bedloe's Island by popular subscription, the statue will be placed on it and be handed over to the national authorities by the commission having charge of the work of erection.

The elevation and sectional view of the pedestal and foundations for the statue, as given on this page, are reduced from the official drawings in the office of Gen. C. P. Stone, chief engineer of the commission, and we are indebted for them to *Engineering News*. The illustration is made to scale, and thus will serve to explain fully the general design and proportions of the statue, its pedestal and the foundations. The following are some of the dimensions of the completed statue:

	Feet.
Base of figure to top of torch	151.14
" " " diadem	116.44
From the heel to the top of the head	111.52
Length of index finger	8.03
Circumference of same at second joint	4.72
Height of head	14.43
Width of eye	2.13
Length of nose	3.67

At the Paris Exhibition of 1878, forty persons at one time could find standing room within the head. Twelve persons can stand together in the torch above the hand, access to which is obtained through the arm.

The pedestal proper stands within the old "star" Fort Wood, on Bedloe's Island, and is 62 feet square at the base, 40 feet at the top, and 114 feet high to the base of the statue when completed. The total height of the tip of the torch flame, above low water, is 324 feet. (These proportions, however, have lately been modified, making the total height 305 ft. 11 in.)

BARTHOLDI STATUE AND PEDESTAL.

The statue is built of sheets of copper about one-eighth of an inch thick. The sheets are shaped by pressure and hammering, and are backed by forgings to give them stiffness. For the smaller details sheets of lead have been pressed upon the model and the copper worked to fit them. The sheets of copper are also attached by ribs, straps and forgings to a strong four-sided iron framework occupying the centre of the figure. The whole is to be anchored to the pedestal by iron rods passing to the very base. The entire weight of the figure is about 440,000 pounds; the copper weighs 176,000 pounds; the remainder is almost wholly wrought iron.

Our readers now have before them all the details essential to an intelligent comprehension of the magnitude of the statue and the relation it will bear to the surrounding land and water. The problem that we have put before them is: "Given these conditions, how would you illuminate the statue?" It is to be borne in mind that the lighting service will be maintained by the government, as the statue becomes a coast beacon as soon as it is completed and handed over to the nation; and that up to the present time no definite plan has been selected. It has been stated that "the electric light to be held aloft by the statue will be the largest and most powerful in the world," and that this light is designed to illumine the lower bay and Coney Island. That assertion is premature, and any reasonable proposition that electricians can make will receive serious attention, especially at the present time when the statue is actually on its way to our shores. Two or three methods of lighting have been thought of. The torch seems to be the right place for the light, and one suggestion with regard to the torch is that vertical beams of light might be projected upward from it so as to be reflected in the higher strata of the air, and thus as "a pillar of fire by night" be visible far beyond the range at which the direct light could penetrate. A light is said to have been shown in this way on the Black Sea from a Russian beacon. Another plan is to place lights like jewels around the diadem. A third plan is to place some lights at the foot of the statue, in the loggia or above it, in such a manner that the rays shall be thrown upward, and thus the illumined face of Liberty shine out on the dark waste of waters and the weary incoming Atlantic voyagers. A material point is that if the arc lights are put at a height of 300 feet in the air they will be subject to great vibration, and hence the carbons may not feed easily. It has of late been strenuously held by one or two writers that the statue should not serve in any way as a *lighthouse*, but it is evident to all that it must be illuminated nightly in some way.

The columns of THE ELECTRICAL WORLD are now open for a free discussion of this subject. How shall the statue be "lighted" or "illuminated"? How many lights are required and what should be their effective candle-power? How should the station be installed and the leads be run? How shall the lamps be supplied with new carbon points? What should be the cost of the plant?

Determination of the Ohm by the Damping Method.

With some few exceptions, says the London *Electrician*, the various methods for the determination of the ohm which were brought before the Paris Conference all gave values of the ohm greater than 1.06 metre of mercury 1 square millimetre in section, except the damping method, which has always led to lower values. M. Mascart has been led to investigate more closely the theory of this method, in order to see if this difference may be accounted for. Without following his mathematical reasoning it may be said that Mascart arrives at a formula which is that given by Maxwell, viz.:

$$R = \frac{M^2 G^2}{2K(\varepsilon - \varepsilon_0)}\left(1 + \frac{2L}{R}\varepsilon\right)$$

where R is the resistance of the coil, M the moment of the magnet, G the mean galvanometer constant, K the moment of inertia of the magnet, L the coefficient of self-induction. When the damping is considerable the duration of the oscillations cannot be determined directly by experiment, and it is more general to deduce it from the relative duration, when the coil is an open circuit, by the formula

$$\varepsilon^2 + \gamma^2 = \varepsilon_0^2 = n_0^2$$

But this formula is not strictly correct; in fact, the correction which ought to be introduced into the calculation of the resistance, in order to take into account the coefficient of self-induction, is half that which is usually taken by adopting the above formula. This correction is, however not the only one which has to be taken into account, but there is a more important one. In actual experiment the induced currents are necessarily very powerful, in order that the damping may be appreciable. These induced currents produce a temporary magnetism in the bar in a transverse direction, which must be taken into account. The intensity of the temporary magnetism of the bar is proportional to the action of the current. This magnetism does not modify the fundamental equation so far as the induction is concerned, but the earth's action on the

bar introduces a new couple of opposite sign to that due to the permanent magnetism, and the value of this new couple must be subtracted. The original hypothesis as to the smallness of the deflections, and the constancy of the galvanometer coefficient *G*, may still leave some doubt as to the degree of exactitude of the result; but at any rate the two corrections referred to both tend to increase the value of the unit of resistance hitherto arrived at by the method of damping.

The Protection of Electrical Inventions.*

BY FRANKLAND JANNUS.

It having been suggested that a few words on the above subject may be of interest, the following brief outline of the bearing of recent decisions upon patent interests is submitted, together with such comments and remarks as seemnecessary to indicate their apparent application and importance.

The tendency of invention at the present time is toward improvement in the details of the great inventions that have brought the science of electricity so rapidly, prominently, and no doubt permanently, to the notice of the thinking, as well as unthinking, people of the civilized world.

As matters stand to-day, the dynamo, the arc and incandescent lamp and devices for regulating and controlling them, the telephone, and its accessories, the motor, and the electric locomotive, inventions which form the foundation stones of the great systems of the future, those, in addition to the thousand and one minor applications which are a constant source of wonder to the general public, and sometimes of amusement to the skilled electrician, seem to supply every want, and render further efforts at improvement unnecessary and unprofitable; but it has seemed so from time immemorial, and our opportunities are at least as good as those of our predecessors.

Our laws give the inventor time for public trial and experiment within which to ascertain the practical utility of his improvements, and during which he usually has ample opportunity to discover their marketable value before expending much time or money thereon.

The history of the Patent Office shows that during the last five years most of the patents granted on electrical inventions have been for improvements upon well-known apparatus. Were this not the case, that department might as well close its doors, for it hardly ever happens that a new system is perfect in its inception, and a single novel and operative device is frequently the subject of a long list of patents.

I take it for granted that you are aware how the Supreme Court has almost stopped the reissuing of letters patent by deciding that where the claims of a reissue cover more, or are broader than the claims of the original patent, they are void, because for another invention.

The cure has been so radical and the reaction so strong that reissued patents are now looked upon unfavorably, no matter what the reason for the reissue, and the safest way is to get your patent out in good shape at first, and then stand or fall by it.

The Patent Office is responsible to nobody and guarantees nothing. The unpleasant fact that patents are so often declared invalid by the courts is a warning to inventors that they must see to it before letting a case go to issue, and be governed by decisions, and if necessary, insist upon what they ought to have *before accepting* the patent, for after that it is too late.

The status of patents for improvements in the details of previously patented devices is generally as follows: The pioneer case, having been properly handled, should contain claims broad enough to cover all obvious changes, equivalents and modifications, and such claims are generally broad enough to cover important improvements as well, and the question is, what value can a subsequent patent have? Being subordinate to the original, the patentee would not be at liberty to manufacture the article covered thereby by simply adding his improvements to it, nor would his improvements give him title to his predecessor's productions, except of course as to old and well-known elements. For example, an improvement in holders for commutator brushes, or in the commutator itself, would not affect some other person's patented armature, nor an improvement in filaments for incandescent lamps, nor a method of sealing the same into the globe.

The practice in the Patent Office is supposed to be in accordance with the latest decisions of the courts in patent causes, and it is much more nearly so to-day than in years gone by. We can therefore best form an opinion of what a patent should contain by considering some of those decisions.

A long line of decisions has been rendered by the Supreme Court of the United States in patent cases, and these decisions cover almost every form of question, but they often involve propositions not to be found in the case under consideration, and the latest cases are always looked to and depended upon for a statement of the law as it exists. Some of the recent decisions having a special bearing upon the most numerous class of patents, namely, those for combinations of old elements to produce new or seemingly new results, I will bring to your attention the three most recent decisions, which were only published last month, my object being to explain what may be, and usually is, covered by a patent for improvement on some other invention, and also what is covered by a combination claim, in order to convey a fair idea of the scope of such a patent, and the rights and privileges of a patentee under such circumstances.

In the case of "Stephenson vs. the Brooklyn Cross-Town Railroad Company," suit was brought for the alleged infringement of three patents, the first one for the combination of mechanism used by the driver for opening the rear door of a bob-tailed street car. The court said "as there is no evidence of invention prior to the date of the application, and as the state of the art at that time shows that neither the separate elements of the devices nor the combination is new, it is held that there is no patentable invention in the contrivance described in the patent, and hence no infringement." (There may have been some novel construction embodied in this case which justified the Patent Office in granting a limited claim therefor which would probably have been held to be good, as far as it went; but there was evidently an attempt to use the patent for more than it was worth by the party bringing suit and it was therefore held to be invalid.)

The second patent was for two bell-cords provided with a system of pull straps passing along the sides of a street car within convenient reach of the seated passengers, for signaling purposes. As the evidence shows that long prior to the application such signaling appliances had been attached to the middle of street car ceilings, there was no invention in changing them to the sides of the cars, and hence the patent is void. (This explains itself.)

The third patent was for a combination of a bonnet, in which was fixed a mirror and an opening in the front door of a street car, by means of which the driver can see what is transpiring within the car without turning his head. As each element is old, and as neither element performs any new office or imparts any new power to the other, and as all combined do not produce any new result or any old result more cheaply or otherwise more advantageously, this is a mere aggregation and not a patentable combination.

This entire decision is extremely important, and will be much referred to in the future, for the reason that it deals with questions arising every day and states the proposition involved more fully, clearly and conclusively than anything heretofore published.

In the case of "Sargent vs. The Hall Safe and Lock Company et al.," suit was brought to restrain alleged infringement of letters patent, the claims of which were for combinations of mechanical elements. The defendants claimed that they did not infringe, because they did not use the combination of elements mentioned in the patent. The court considered the patent upon its face, and then considered the references upon which the application was several times rejected. They then took notice of the many amendments and persistent efforts required to secure an allowance, and decided that "in patents for combinations of mechanisms, limitations and provisos imposed by the inventor, especially such as were injected into an application for the purpose of securing an allowance after it had been persistently rejected, must be strictly construed against the inventor and in favor of the public, and looked upon as in the nature of disclaimers, and further, that the mechanism of the defendant's lock not being the same as that covered by the patent, there was no infringement."

The court did not say that the patent was bad, but simply that in view of the state of the art at the time the patent was granted, with which every inventor is presumed to be familiar, he claimed more than he was the first inventor of, and that while it was perfectly good for what was novel, they did not propose to assist him to recover more than he was really entitled to.

The cases just cited refer to the mechanical devices, and you might naturally ask, How does the court regard the combination of electrical elements? The following will throw some light on that question.

In "The Electric Railroad Signal Company vs. the Hall Railway Signal Company," also published last month, and which was a suit for infringement, it was held that defendants did not infringe, because the claims being for combinations of elements, they not having used the entire combination or substantial equivalents therefor, that they had not rendered themselves liable. The substance of the decision is as follows:

"The patent is for a combination in which the elements were known and open to the public use. Its object was the accomplishment of a particular result, namely, to work electric signals on the block system. But the thing patented was the particular means devised by the inventor to accomplish that result, and to constitute in this case identity of invention, and therefore infringement, the result, the elements or their equivalents and the combination must be the same, so that each element shall perform the same function.

"In complainant's patent insulated sections of the rails as circuit-closers constitute an essential element in the combinations, the wheels and axles of the train forming an electrical connection between the opposite insulated rails at appropriate places, and so actuating the signal. The defendants dispense with insulated sections of the track, and employ a separate instrument placed near the track, from which the lever connects with the track, and is operated by the passing wheels of the train.

"In complainant's patent, a single battery is used to operate an electric current of considerable length by means of two wires or other metallic conductors attached to the positive and negative poles of the battery, and suitably insulated from each other and from the earth. The defendant's plan does not include such a metallic circuit, but uses a circuit composed in part of the earth. In this case the evidence shows the difference is more than a mere substitution of the earth for one of the conducting wires. It consists in the use of new elements, a new combination and a new result."

From the foregoing it will be seen that the legal construction of combination claims is comparatively strict on the theory that all the inventor has done is to assemble well-known elements in a manner different from his predecessors. He cannot acquire title to those elements except in his particular combination, and any other person is at liberty to combine a greater or smaller number of the same elements, if by so doing they do not attain the same result in practically the same manner. When, however, the invention consists in some new thing having an existence separate from a group of well-known elements, then the case is entirely different, and the inventor is entitled to, and the patent should contain, a claim for the thing itself. If the single element is designed to form part of a group, the patent should also contain claims for the combination, and such claim would, like any other combination claim, be evaded by the omission of any essential portion of the

* Read before the Institute of Electrical Engineers, May 20, 1885.

The people of the Republic of France have presented the people of the United States with the Bartholdi Statue of Liberty, in commemoration of the first century of American national independence. It is the grandest and most magnificent gift ever made by one country to another. The cost, $250,000, was raised by popular subscription, and it is now proposed to defray the cost of the Pedestal in the same way. The *New York World* has undertaken to raise the $100,000 necessary to complete the Pedestal, and has already received about $50,000 from more than 50,000 persons.

The Statue, which will arrive here in June, is to stand on Bedloe's Island, New York Harbor, will be illuminated nightly by the electric light, and will thus serve to exemplify the triumph of the latest development of electricity, as well as the friendship of two great Republics. The movement is one, therefore, in which all interested in electrical pursuits and industries should be proud to take part. All subscriptions entered on this blank will be acknowledged in THE ELECTRICAL WORLD and paid over to the *New York World*.

	Ft.	In.
Height of bottom of foundation-mass above mean low water,	13	00
Height of foundation-mass,	52	10
Height of pedestal,	89	00
Height of top of torch above top of pedestal,	151	01
Height of top of torch above mean low water,	305	11

Bartholdi Pedestal Fund.

The above design appears on the slips sent out from this office for subscriptions to the Bartholdi Pedestal Fund. The letterpress at the side describes fully the object of the fund, and the article on the previous page gives some very interesting information as to the statue itself. All subscriptions sent in to the fund will be duly acknowledged in THE ELECTRICAL WORLD under this head, the name and amount appearing in each case. Several good contributions have already been received.

combination, but the element covered by separate claim cannot be used singly or in combination, without liability to the patentee.

Devices may be constructed in which the element is included, and combination claims including said single element may be presented, and the Patent Office, if unable to meet the combination with references, would be obliged to allow them, but that does not give the patentee of the combination any title whatever to the element invented and patented by another; it only gives him title as against some other "combiner," while he himself will have to secure a license from the inventor before he may lawfully use it.

This, you see, leaves a clearly defined and very large field for the inventor of the present day, for where there is actual novelty, more than mere combination of old devices, such claims can always be obtained as will afford complete protection. One difficulty to be overcome is that of knowing at the time the patent is taken out all the modifications and adaptations of which the invention is capable. There are many cases in which, with best intentions on the part of all concerned, patents have been less comprehensive than they might have been, and it seems that the best thing to do is for the inventor to consider all the practical applications of his central idea and then proceed to patent them all, for in this country the cost of a patent is really very small as compared to the privileges granted, and there are no further expenses after the patent has issued.

Taken as a whole, I think that our patent system is really as wonderful as our system of government, like which, while offering the greatest prizes to any man whose genius, industry and diligence enable him to secure them, yet the enjoyment and the acquisition depend almost entirely upon the individual.

The law assures the full enjoyment of privileges acquired, but guarantees nothing until the individual has, by proper proceeding, perfected his title to the thing desired.

That thousands of worthless patents are granted every year is not the fault of the Patent Office, but is due almost entirely to the insistance of unscrupulous attorneys whose fees are staked upon the procuring of a patent, whether worthless or not being frequently a matter of indifference to them, and sometimes upon the demands of clients who are impervious to advice or criticism, until, as the possessors of useless patents, their ambition dies a natural death. There are, too, cases in which a patent that would not stand the test of a court is really of advantage to the inventor, but the first-named cause is by far the most common.

An idea seems to be entertained by many that the less a person is hampered by knowledge of a particular art the better his chances of being original, and the more likely he is to strike into a new line, and to capture a grand idea which, when harnessed and put to work, will develop into a tidal wave of prosperity, like the winning ticket in a lottery. Observation has shown that such inventors will rarely consent to a preliminary examination at any price, and that they are the most ready to assert that the examiner has failed to comprehend their invention.

The examiners are, as a class, exceedingly capable, but one thing should be remembered, which is, that they do not occupy the position of critics, and while it is often apparent to them that an application might be advantageously altered or more fully developed, still they can only act upon what is before them; they have nothing to do with what might be. That is mere speculation, and they are not in the position of investigators; they are simply there to deal with what is, and knowing more or less about all the patents in their particular class, an invention appears smaller to them than to a person unacquainted with the state of the art.

When it is remembered that, as a part of the result of the labors of these gentlemen, thousands of old and often absurd ideas are every year consigned to oblivion, instead of being spread upon the record, and that on reading the claims of a patent, if there is nothing more in it than some trifling combination, that fact at least will be at once apparent, thus saving the public in general much trouble and expense, the beauty and advantages of our system as compared with the systems of other nations, and the way in which our laws contrive to offer the maximum encouragement at the minimum public expense, will be better appreciated.

THE TELEGRAPH.

Reduced Rates.—The Bankers & Merchants' Telegraph Company announce the following rates under date of May 25, for ten-word messages between New York and the following points: Boston, Fall River, Hartford, Philadelphia, Washington, Baltimore, Providence, Newport, 10 cents; Chicago, 15 cents; Pittsburgh, Rochester, St. Louis, 20 cents.

An Ocean Cable Broken.—A dispatch of May 18 from Portland, Me., says: "The schooner 'Alice M. Gould,' of Portland, Capt. Edward Iness, which arrived this afternoon, reports that on May 11, while on a halibut trip, in latitude 44° 48″ north, longitude 61° 42′ west, she fouled her anchor with and parted an ocean cable.

Prof. Van der Weyde in Philadelphia.—In Philadelphia, on the 20th inst., at the Franklin Institute, Professor Van der Weyde, M. D., explained the Phelps system of telegraphy from and to moving trains, in which an insulated wire is run through a wooden box placed on the ties between the tracks. Under the middle of the car is suspended an endless cable, properly protected against injury, and reaching to within eight or ten inches of the insulated conductor or main line between the tracks.

Another Bucket Shop Gone.—Many of the Buffalo bucket-shop gamblers are bemoaning losses they claim to have sustained by the sudden suspension of the local branch of Skidmore, Brown & Co.'s office in the Hayen Building. The firm did a big business when they opened, but when it became established that they were doing nothing but bucket-shop business, many of their customers left, and since May 1 they have been in hard luck. They owed for rent, and could not pay. The Western Union Company cut out their special wires, and they have closed up shop. The local manager, Thomas G. Perkins, has, it is thought, gone back to New York. Many of the customers claim that they have been badly swindled.

Boston Messenger Service.—The report of the General Manager, D. J. Hern, of the Mutual District Messenger Company, for the year ending March 31, 1885, shows the company to have increased the mileage of lines 42 miles, and increased the number of call boxes in circuit 1,093, making a grand total of 170 miles in operation, and 3,108 boxes. During the year the company delivered 1,283,960 telegrams, and collected 427,076 telegrams; the messengers answered 463,814 calls and earned for the company from telegraph service $66,307.76, and from district service $25,799.70. Besides earning and paying taxes, operating expenses and continuous quarterly dividends, at the rate of 8 per cent. per annum, they have expended $5,745.30 on construction. The company has no debt, has an issued capital of $200,000 and $50,000 in stock in the treasury.

Personal.—The wedding of Henry Sanger Snow, of Brooklyn, to Anna Le Conte, youngest daughter of David Brooks, the distinguished electrician, took place at the residence of the bride's parents in Philadelphia, on Wednesday, May 20. The bride wore a white satin dress trimmed heavily with Irish point. The bridesmaids were Miss Chatfield, of Brooklyn, and Miss Brooks, of Brooksvale, Conn., cousins of the bride. They wore dresses of white crepe and carried bouquets of Cook roses. The ushers were Archie J. Fisher, of Chicago; W. Irving Babcock, of Brooklyn; William H. Taylor, of New York; R. Wilson McCredy, Edmund Bell and David Brooks, Jr., of Philadelphia. The groom's brother, Edward L. Snow, was best man. The ceremony was followed by an elaborate breakfast. The presents were numerous and costly. Numerous telegrams of congratulation were received from Europe, notably from W. H. Preece, chief of posts and telegraphs of Great Britain, and the Earl of Crawford and Balcarres. The bridal tour will be a drive through New England to Canada.

The Suits Against the Lowell Syndicate.—The three important suits begun against the quintette of gentlemen familiarly known as the telephone syndicate—William A. Ingham, Loren N. Downs, Charles J. Glidden, William H. Bent and Alonzo A. Coburn, are as follows: The first suit is that of James W. Bennett, and is an action of contract and tort. The amount specified in the writ is $55,000, being the sum alleged to have been lost to the plaintiff through the false representations of the defendant syndicate, by which he was induced to invest in the stock of the Erie Telegraph and Telephone Company. The writ is returnable at the June term of the Superior Court, to come in at Cambridge on the first Monday in June. The second suit is that of Alexander W. Sherman against the same persons in a similar case, the amount being $60,000, and Erie and Southwestern stock are mentioned as the securities in which he invested. The third suit is brought by Henry L. Tibbetts, for $20,000, on the same grounds.

THE TELEPHONE.

A Lightning Arrester.—Mr. M. S. Gardner, general manager of the Pueblo Telephone Company of Mexico, has invented a lightning arrester for the use of telephone and telegraph companies, which is said to have proved by actual test to be of great importance. Mr. Gardner has applied for patents in Mexico and the United States.

Gaining in Germany.—The progress realized in Germany by the telephone during the last ten months of the year 1884 is as follows: Additional exchanges 9, additional subscribers 1,953, increased mileage of wire 2,095. The principal exchanges are those of Berlin with 2,178 subscribers, Hamburg with 1,224 subscribers, Frankfort-on-the-Main with 366, Dresden with 354, Leipzig with 321, Mannheim 254, Cologne 223, Stettin 222, and Magdeburg 194.

Output of Bell Telephones.—The net output of telephones for the month ended May 20 was 2,442, against 1,690 last month, 60 the month before, and 5,023 in the corresponding month of 1884. The net output for five months this year is 3,304, against 18,721 for like months last year. There was a net loss of 888 the first two months of 1885, so that the later record shows marked improvement.

Evansville, Ind.—Major N. M. Booth, one of the pioneer telegraphers of the Ohio Valley, introduced the telephone in Evansville—the first telephone exchange opened in Indiana, and he thinks the first in the West, as the machinery had been sent to Kansas City, Mo., but not being ready to put it up there, the general manager, H. H. Eldred, had it forwarded to Evansville. Capt. Geo. L. Masters is manager of the exchange. There are now ten lady operators besides the night operator, and four linemen. The system has rapidly grown from small beginnings to great importance, and is destined to still greater growth.

Across the Ocean.—A score of electricians attended the meeting of the Polytechnic Association at Cooper Union, on the 21st inst., and listened to a lecture from A. M. A. Beale on the long-distance telephone. Mr. Beale gave an account of his experiments which resulted in the talk from Chicago to New York in February last. Mr. Beale said that Mr. Gillett, the inventor of the long-distance instrument, first described in THE ELECTRICAL WORLD in 1884, was at present in England, and would undertake a series of experiments on the Commercial cable some time during the coming summer. Mr. Beale is busy making the instruments to be used in these efforts.

Tropical.—The Tropical American Telephone Company has sold its exchange at Trinidad, W. I., to local merchants, who will carry on the business under the name of the Commercial Telephone Company. Some months ago it sold its Barbadoes exchange to merchants of that island, who organized the Barbadoes Telephone Company, limited. By these sales the Tropical Company recovers its original investment, $18,000, a profit of about $5,000, and secures permanent contracts with both companies for future instruments and supplies. Since the sale, the Barbadoes Company has ordered 50 more complete sets, the Trinidad Company 100 additional sets, beside switch-boards and supplies to equip and increase the plant to 200 subscribers at the former and 250 subscribers at the latter place. The money recovered from these properties represents profits of the company's business which were invested in them, and is sufficient for dividends for some time.

Retrenchment.—The retrenchment inaugurated by the New England Telephone Company's executive committee yesterday will, it is said, reduce the running expenses over $10,000 a year, without detriment to the efficiency of the company. It was voted to abolish, July 1, the office of regular attorney, to which a salary of $3,000 per year is attached. The position is at present filled by W. H. Bent, of Lowell. It was also voted to abolish the salary connected with the office of vice-president. The salary has been $6,000 per year. A. C. Sanborn, superintendent of the Lowell division, tendered his resignation, the same to take effect June 1. The resignation was accepted, and the position will not probably be filled. The committee also has in contemplation a plan of reorganization which will effect a consolidation of exchanges in the matter of management and make a large saving in running expenses. Several changes are also contemplated with the object of further reduction of expenses, in disposing of superfluous help. No reduction of salaries is contemplated.

Interesting Statistics.—The committee of the Massachusetts Legislature which has been examining the books of the American Bell Telephone Company, reports the cost to the Bell Company of the ordinary rubber hand telephone is $1.62, and of the transmitter, $1.80; total, $3.42. The average rental charged by the Bell Company of the sub-companies is, as is well known, $7 per year each for the hand telephones and the transmitters. The net earnings of the Bell Telephone Company for the year ending March 1, 1885, were $1,710,892.69, and, according to the statement of its officers to the committee, it could have paid a 17 per cent. dividend on its present stock. The company now owns 329,826 telephones, of which 32,442 are in Massachusetts. It received for rentals during the year ending March 1, $1,969,742.74. The company owns stock in local telephone companies which is carried on its books at $22,016,573.36, but the real value of which is not known. Stock paid in for franchise is carried at par, while stock purchased above par is reduced to par. The company has received $1,021,730.26 in dividends on these stocks.

THE ELECTRIC LIGHT.

By the Bright Light.—May 20, the opening day of the Williamsburgh Athletic Club, Brooklyn, was marked by the attendance of 7,000 persons at the games, which were continued through the evening with the aid of the electric light.

Dynamo-Electric Machines.—A lecture was delivered on May 15 before the Buffalo, N. Y., Electrical Society, by Mr. A. L. Avery, on the principles and uses of dynamo-electric generators. The lecture appears from the report to have been highly interesting and instructive.

Hamilton, Can.—The City Council of Hamilton, Ont., has been advised by its special committee to adopt 40 of the Royal Company's arc lamps and 15 of the Kay Company's, at 43 cents per night from dark to daylight. The Royal Company has organized a local company in Hamilton to run Thomson-Houston lights and to go into the incandescent business as well.

Fire at the Excelsior Electric Company's Works.—Late on the night of Saturday, May 23, fire was discovered on the top floor of the Excelsior Company's Works in Brooklyn. It originated in the brass foundry, one corner of which was burned out. The damage, which will foot up about $15,000, was caused chiefly by water, and only affects one side of the works, which are again in full running order at this writing.

Dynamos for the English Navy.—Twenty of the picket boats which are building for the Admiralty are each to be fitted with engines and dynamos for use with search-light projectors. These dynamos and engines have been ordered from the Anglo-American Brush Electric Light Corporation, who have also received instructions to supply similar apparatus for the gunboats "Tees," "Spey," "Tay," "Slaney," "Medena" and "Medway," and for the tugboats "Woodcock" and "Magnet."

MISCELLANEOUS NOTES.

Electricity and Insects.—A curious phenomenon is reported from some of the Malaga vineyards, where plants, attacked by the phylloxera and given up as practically dead, have begun to show marked symptoms of vitality, due, it is believed, to the destruction of the insects by gases or "electrical conditions," consequent on the recent earthquakes in the locality.

Hatching by Electricity.—A dispatch from Centralia, Mo., mentions as follows a curious occurrence: The late rainstorm displayed some curious electrical phenomena. Lightning struck a cedar post at the corner of Mr. Jessie Park's hen-house and pig-pen, filling the air with fine splinters. A lot of little pigs in the pen were peculiarly affected. They commenced squealing, and for about ten minutes darted wildly about the inclosure, then, crawling under the floor, never made their appearance for two days after. In the hen-house a setting hen was not disturbed from her nest, but every egg under her was scattered about the hen-house, and strange to say not one was broken, and more curious still every one of them hatched a live chick the day after.

APPLICATIONS OF POWER.

Proposed Electric Railway at Ryde Pier.—At a recent meeting of the Ryde Pier Company, England, a resolution that the traffic on Ryde Pier can best be worked by electricity was adopted, after an extended debate.

The Portrush Railway.—An extension of this electrically-worked line is said to be under consideration. Some opposition has been offered on the ground of danger from electric currents, and Sir William Thomson has already given evidence as to the immunity of the system from any liability to injure persons.

The Bidwell Line, Philadelphia.—The interest of Philadelphians is greatly aroused in the Bidwell electric railway that is to run along Belmont avenue, in Fairmount Park. The road as now planned will be about a mile and a quarter long, and will require ten cars carrying from fifty to sixty passengers each. To furnish power for these and light the avenue and cars by the same system, about 100 horse-power, it is said, will be required at the generating station.

Electric Launches.—At the invitation of a foreign government, Mr. Reckenzaun has produced designs for a torpedo-service launch, to be propelled at high speed by electricity. The conditions enjoined are that this craft should make a voyage across the English Channel and back in moderately fair weather, and the construction of the vessel and machinery is to be commenced without delay. In view of important improvements in the electrical appliances, her speed may be expected to exceed anything hitherto attempted.

Electrical Transmission of Power in Switzerland.—There are two turbines, one working at high pressure and the other at low pressure, placed at the village of Boujeon, at the falls of the River Suze. The high-pressure turbine has been in use for rather more than a year to work a dynamo machine for the electrical transmission of power to two factories at Bienne. The total height of the fall is 177 feet and the quantity of water 330 gallons per second. The turbine, however, only utilizes actually 157½ feet of the fall, and can take, when the guide blades are wide open, 88 gallons per second. The turbine is one of Girard's, with a horizontal axle, driving accumulator shaft by spur gearing. The generator is a Thury dynamo machine of the type H_2, compound wound, and is driven by a belt from the countershaft. It runs at a speed of 500 revolutions per minute, and gives an E. M. F. of 350 volts. The conductors consist of two copper wires 7 mm. in diameter (about No. 2 B. W. G.), carried on telegraph posts and insulators. The motor is also a Thury machine of the H_2 type, compound wound. It runs at a speed of 400 revolutions per minute, with a difference of potential of about 300 volts at the terminals. The distance from the generator to the motor is about 1,367 yards, and the motor gives out from 6 to 18 horse-power. Both ends of the line are protected by lightning conductors, a very necessary precaution in a district where thunderstorms are very prevalent. When starting the motor, a resistance is at first switched into the circuit, but this is cut out by step as the machine starts. It is stated that a commercial efficiency of 70 per cent. has been obtained.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Cable, b 58, a 59; Am. Dist. Tel., b 15, a 19; B. & M., a 3; Postal stock, b ⅛, a 1; Postal sixes, b 9⅛, a 10; Western Union, b 60⅛, a 60⅝.

Telephone.—Am. Bell, b 190, a 191; Erie, b 20; Mexican b 1¼; New England, b 31, a 32; Tropical, b 1¼.

Electric Light.—Edison, b 65.

BUSINESS NOTICES.

Early Telephony.—All persons who experimented with or used the Reis telephone before the year 1876 will please send their address to Briesen & Steele, 229 Broadway, New York.

Anti-Magnetic Shields for Watches.—These shields, made by Giles, Brother & Co., State and Washington streets, Chicago, are an efficient protection to the works of watches from magnetism, as many testimonials in their possession show. This firm also demagnetize watches which are already affected.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED MAY 5, 1885.

Electric Liquid Gauge and Alarm; Jeffrey C. Boyle, Brooklyn, N. Y..... 317,289

A pivoted swinging arm carrying a float, makes electrical contact with one or more circuits containing electric bells, so that for different depths of water, one, two, three, etc., gongs are sounded.

Cartridge for Electric Firearms; Edgar A. Montfort, New York, N. Y., Assignor by mesne assignments to the Universal Electric Arms and Ammunition Company, of same place..... 317,409

Consists of two conductors passing through a block at the butt end of the cartridge, and connected at their tips within the charge of powder by a platinum wire, said platinum wire being provided with a wrapping of gun-cotton.

Electric Weighing and Recording Device; Edward H. Amet, Chicago, Ill., Assignor to Herbert U. Streeter, of same place..... 317,432

Consists, broadly, of electrical devices connected with a platform upon which are mounted the rails on which a car, loaded or unloaded, may be moved, and adapted to automatically register, record, and indicate the weight of each car and its contents as it passes over said platform. The invention also consists in certain other modifications and features of construction.

PATENTS DATED MAY 12, 1885.

Electrical Accumulator; Jules J. Barrier, Ferdinand Tourveille, and Jules E. Legay, Paris, France..... 317,487

The elements consist of either tubes, cylinders, blades, bands, or ribbons of lead, fluted, channeled, or grooved, some externally, some internally, and some both internally and externally. They may be undulated or spirally twisted and boxed, one within the other, the grooves, flutes or channels being either straight, curvilinear, zigzag or inclined at angles varying from thirty to forty-five degrees. These grooves are coated with a mastic composition, which they serve to hold, and which consists of glucose combined with ten parts of litharge and three parts of platinized carbon, said substances when combined with the carbon constituting an efficient element of the battery. The sulphuric acid is replaced by a solution of permanganate of potash.

Annunciator and Fire Telegraph; Charles K. Pevey, Worcester, Mass..... 317,569

Consists of the arrangement of an alarm-bell and double or

317,610. ELECTRIC LIGHTING SYSTEM AND SWITCH.

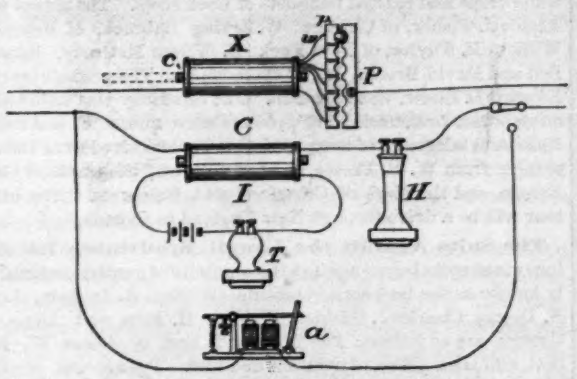
single-acting swing-switch or a press-button switch in one or more sleeping-rooms, connected by means of electric main battery and circuit wires with a switch and also with the annunciators now in use in the office or other room, so that when the switch in the sleeping-room is closed on the bell, and the switch in the office, being open, is moved to close the circuit, it will set the bell ringing continuously in the sleeping-room until the person is aroused sufficiently to get up and switch it off, in doing which with the double-acting switch it will announce the fact of his being up at the office through the annunciator without the use of the push-button switch, so that the push-button may or may not be used for this purpose, and can be used at any time from the room to the office, if desirable.

Electric Lighting System and Switch; William S. Andrews, New York, N. Y., Assignor to the Edison Electric Light Co., of same place..... 317,610

Consists of a switch for the Edison three-wire system. Consists of the combination, with a pivoted switch-lever carrying insulated contact-blades *B* and *B'* on opposite sides of its pivot, of a contact-plate *C* with which one of said blades is constantly in contact, two contact-plates *b* and *F* on opposite sides of the same blade, with one or the other of which the blade makes contact when the lever is thrown in either direction, and two sets of contact-plates *D* and *E* on opposite sides of the other contact-blade, said plates being bridged by this latter blade.

Incandescent Electric Lamp; Thomas A. Edison, Menlo Park. N. J., Assignor to the Edison Electric Light Co., New York, N. Y..... 317,631

The object of this invention is to provide the incandescing electric lamp with a base of simpler and cheaper construction; to which end it consists in a base formed upon the neck of the lamp entirely of an insulating plastic material, to which are secured, preferably in the process of manufacture, the necessary contact-plates, such plates being joined together and held upon the neck of the lamp-globe by the plastic material. These contact-plates are preferably in different horizontal planes, and one



317,888. TELEPHONE CIRCUIT.

is a screw-ring, the location of the plates in different horizontal planes permitting the lamp to be revolved while the base is entering a socket without short-circuiting the socket.

Incandescent Electric Lamp; Thomas A. Edison, Menlo Park, N. J., Assignor to the Edison Electric Light Co., New York, N. Y..... 317,632

Consists of the combination, with the incandescing conductor, of an insulating piece attached to said conductor and metallic terminals supported by said insulating piece connected with said filament, and removably connected with the leading-in wires of the lamp.

Incandescent Electric Lamp; Thomas A. Edison, Menlo Park, N. J., Assignor to the Edison Electric Light Co., New York, N. Y..... 317,633

At the top of the lamp is a tension spring upholding a part of the weight of the filament for the purpose of compensating for the expansion, contraction, flexion, etc.

Electric Light; William E. Sawyer, New York, and Albon Man, Brooklyn, N. Y., Assignor to Electro-Dynamic Co., New York, N. Y. Filed January 9, 1880.. 317,676

Consists of a carbon filament made from vegetable material inclosed in a hermetically sealed glass vessel.

System of Electrical Distribution; William S. Andrews, New York, N. Y., Assignor to the Edison Electric Light Co., of same place..... 317,700

Relates to the compensating or three-wire system of electric lighting, in which three conductors extend from the source of supply, and the lamps are connected between the main conductors and the central or compensating conductor, the source of supply being also divided, and the compensating conductor being connected at the point of division of said source. In such a system, if the generator or generators comprising one of the divisions of the source should break down or become inoperative from any cause, or if the number of lamps in circuit becomes at any time so small that the generative capacity of one of the divisions is sufficient to supply them all with current, it is desirable to remove one of the divisions from the circuit and to throw the whole system upon the other. Consists of the combination, with positive and negative main conductors, of a compensating system of electrical distribution of switches, whereby either division may be disconnected from its main conductor, and both said main conductors connected with the same terminal of the other divisions.

Apparatus for Making Curved Carbons; Charles F. Heinrichs, New York, N. Y..... 317,776

The discharge pipe is formed of a circular shape, and is attached at the end of a cylinder provided with a piston.

Electric Lamp; Charles F. Heinrichs, New York, N. Y..... 317,777

He claims, in an electric lamp, a pair of curved carbon pencils mounted upon movable arms insulated from each other and combined with moving and regulating mechanism whereby said pencils, when the lamp is in operation, are caused to approach each other and to maintain the arc constantly at substantially the same point.

Electric Lamp; C. F. Heinrichs, New York, N. Y.... 317,778

Consist of two sets of carbons as shown, each adapted to feed toward each other by means of gearing wheels located upon the ends of the carbon-holders a^1, a^2, a^3 and a^4. The arc is formed between the two sets of electrodes.

Dynamo-Electric Machine; Charles F. Heinrichs, New York, N. Y..... 317,779

The part of this apparatus which the invention more particularly concerns is the ring-armature or induction-coil of the class well known as the "Pacinotti" type. Consists of a ring-armature wound with insulated wire and chambered or recessed on the side or sides not exposed to the inducing-magnet. It consists, also, of an improvement in the iron core when the same is made of sections instead of solid iron, formed of a framework or shell wound with sections of iron wire piled one upon the op of the other.

Electric Glass-Cutting Machine; Philip Lange and Ernest Linder, New York, N. Y..... 317,805

It is constructed with a platform having tubular sockets and set-screws, and supported by posts having at their upper ends slotted bars to receive adjustable insulated bars, with which are connected the circuit wires of an electric generator, which are provided with a switch, and are connected with a wire tightened by elbow-levers operated by a treadle connected with the said levers by pivoted bars, the said wire being slackened by a spiral spring.

Lightning Protector; Horace A. Pitcher, Philadelphia, Pa., Assignor by mesne assignments to Robert F. Williams, New York, N. Y..... 317,848

Consists in constructing an electro-magnet with two coils, one end of each coil being connected with the main line, while the remaining ends are connected with the conductor including the instruments to be protected. Normally, therefore, a current from either direction traverses first one coil of the electro-magnet, then the instrument to be protected, and then the second coil of the electro-magnet.

Wiring Interiors for Electric Lights; Luther Stieringer and Jonathan H. Vail, New York, N. Y., Assignors of one-half to Charles F. Harrington and Richard N. Dyer, both of same place..... 317,879

The staples are made of an insulating material and the wires are fitted in grooves so shaped that water runs from them as fast as it tends to collect.

Flexible Tip for Conducting Cords; George K. Thompson, Malden, Mass., Assignor to the Bell Telephone Co., Boston, Mass..... 317,887

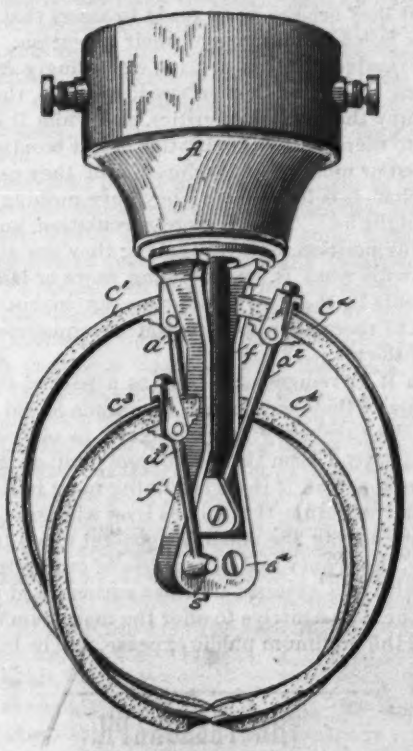
Consists in a tip or terminal having flexibility and resiliency in all directions, and formed into a tube by a series of helical convolutions, sufficient in number to give the desired length of tube, one end being cut off short at the end of a convolution and the opposite end extended in a line with the axis of the tube, to form the needle or tip for insertion into the screw cup.

Telephone Circuit; Henry S. Thornberry, Boston, Mass..... 317,888

Consists of the combination of an indicating instrument *a*, located in one side of a metallic circuit, or loop, and an adjustable resistance *X*, having a core *c*, adjustable with respect to the extent of its insertion in the solenoid.

Electric Conductor for Wire Fencing; Chas. Williamson, Washington, Kansas..... 317,908

Consists in providing auxiliary pointed iron posts or lightning conductors at intermediate points between the fence posts.



317,778. ELECTRIC LAMP.

Track Instrument; Henry D. Winton, Wellesley Hills, Mass..... 317,910

Improvement upon Snow's patent of Oct. 21, 1883, 143,935. The improvement provides a rock shaft arranged to rotate on its axis transversely to the railroad track in order to secure a uniform action of the circuit-closer, and to render the same available in such cases where the circuit-closer is to be actuated only by trains passing over the track in one direction, and not to be actuated by trains passing in the opposite direction.

Electric Signal; Henry D. Winton, Wellesley Hills, Mass..... 317,911

Consists in a combination of electro-magnets, levers, chains and pulleys, for the purpose of operating so as to give the signalman no opportunity to give a wrong signal.

Call Box; Frank B. Wood, New York, N. Y., Assignor to Henry Thau and Emanuel Bleoo, same place.. 317,912

Consists of a box made by molding a non-conducting material into the shapes required for the sides, top and bottom respectively, providing suitable openings, screw joints, projections, etc.